Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 65 NEW YORK, SATURDAY, APRIL 24, 1915 No. 17

Indiscriminate Valuation

INDISCRIMINATE valuation has been demonstrated in Ohio to be a burden on both the physical limitations of the Public Utilities Commission and the tax-bearing docility of the public. The commission has been unable to keep up with the tasks imposed on it by law and the demands of communities that wanted instant valuation of privately owned utilities for rate-making purposes. Agitation over the complicated facts led to the introduction of a legislative bill to amend the law so that valuations shall not be mandatory upon the commission. The plan to reduce the commission valuation staff in the interest of economy answers those who think that the State is spending too freely, but it does not please communities that hold local problems paramount. Unless there is specific need for valuations, the cost should be saved. Great as is the direct cost to the public, it is probably less than the indirect cost through the expenses that companies must make when valuation is enforced. The destruction of capital in Europe will make economy more fashionable, and it is well to inform the public about such unappreciated costs.

Electrification for Increasing Terminal Capacity

ACCORDING to an official announcement, on May 30 the Pennsylvania Railroad will begin electrical operation of suburban main-line trains from the Broad Street station, Philadelphia, as far west as Paoli, Pa. Other aspects of this project have somewhat obscured the fact that one of the principal reasons why it was undertaken—in fact, the decisive reason—was that electrical operation would largely increase the service capacity of the existing terminal, an increase that was imperatively needed and which, without the substitution of the electric for the steam locomotive, could be obtained only at enormous expense. Having reached the limit of existing terminal facilities, the railroad was forced to consider the next step to be taken. It could either increase its facilities at Broad Street by the purchase of additional property and laying additional trackage or it could introduce electrical operation for the suburban traffic. The latter plan was adopted for the reason that it secured economies in operation sufficient to pay the interest on the cost of installation. In other words, as Mr. George Gibbs has pointed out, the increase in capacity is to be obtained by means of an equipment which practically pays for itself. The conditions at Philadelphia are not unusual as affecting the congestion of city terminals, and this fact, taken in connection with the enormous expense involved in expanding terminal trackage in the heart of cities, lends particular significance to the great possibilities in the direction of increasing terminal capacities while saving enough money on operation to pay interest charges on the investment that may be made in electrification.

Investigation of the New York Commissions

THE conclusion of the legislative committee in regard to the New York Public Service commissioners was complicated by eleventh-hour amendments and by majority and minority reports. The Republican majority members appear to believe profoundly in the removal of Democratic commissioners, but instead of making positive recommendations to this end, they prefer to let Governor Whitman exercise his own judgment. Thus they evade responsibility. The critical conclusions concerning the commissioners are summed up in "inefficient." It is difficult to believe that the Second District commission would authorize capitalization of any elements in as clear violation of the law as the committee bluntly states; some so-called intangibles are properly capitalizable. There are constructive features in the report that can be followed with much more certain advantage than has accrued from the pursuit of individuals. One is the suggested relief of the First District commission from supervision of rapid transit construction; another is the issue of stock without par value. The committee evidently likes its task, because it asks continuation, and this request, if granted, will mean a long period in the course of which something may "turn up."

Telephone Inquiry Stopped

EVIDENTLY little progress had been made in the investigation of telephone and telegraph companies which the Interstate Commerce Commission has now discontinued. It was started on Jan. 13, 1913, but one year later, after the peaceful settlement of the government anti-trust suit against the American Telephone & Telegraph Company, the preliminary work was stopped. The commission is to be commended for its public announcement, the effect of which is that further prosecution would waste money. Closer co-ordination of the work of the commission and the Department of Justice, it appears from the history of the case, would have meant still greater saving. If the Department of Justice was right in its contention that the act to regulate commerce conferred ample powers upon the commission, the doubt of the commission as to its jurisdiction was not well founded. However, the settlement that was

made finally with the Attorney-General was excellent, not only because it definitely removed the basis of controversy, but for the impressive reason that it proved the willingness of "big business" to comply with the government interpretation of the law.

Making the "Movies"

In many respects the production of moving-picture films is an art by itself, calling for an entirely new line of scenery, new methods in adjusting it to the requirements of the occasion, and a particular knack in acting so as to obtain the best results. From a practical standpoint one may add to these severe requirements a special line of photographic art in making a good reproduction of the scene. Not the least of the difficulties to be overcome is that of proper lighting of the stage so as to obtain a suitably graded negative in the very brief time allowable for a single exposure. Exposures on objects involving rapid action will ordinarily run somewhere from 0.01 second to 0.02 second as against from three seconds to thirty seconds in ordinary indoor work concerning objects other than a simple figure carefully lighted as in portraiture. One may discount the difference for the two cases somewhat on account of the enormous speed of the cinematograph lenses, but even so there is an outstanding ratio of something like one hundred to one between ordinary indoor photography and that required on the production stage of a moving-picture establishment.

In a brief article in this issue Mr. L. G. H. Smith gives a somewhat detailed account of the methods of lighting motion-picture studios which have actually been found successful in practice. The usual small size of the working stage is the salvation of the situation when artificial lighting is needed. Speaking in general terms, the stage may be from as small as 10 ft. by 12 ft. or 15 ft. up to about double these linear dimensions, and the photographic requirements demand that so far as moving figures are concerned the action shall be confined to a somewhat narrow portion even of this limited area. Anyone familiar with photography who will watch carefully the presentation of a photo-play will quickly realize the limitations of space. An actor's hand unwarily extended to arm's length toward the camera almost always shows distortion.

Experience seems to have proved desirable an arrangement by means of which powerful general illumination is obtained from above supplemented by side lighting which can be regulated in intensity and perhaps also in direction. Either or both sets of lamps may advantageously be provided with movable screens for use when necessary, and sometimes opaque white screens for secondary diffusion are found useful in the wings. Inclosed carbon-arc and mercury-arc lamps seem to be the favorite sources of illumination for this work, with incandescent lamps just beginning to come into use. Both the inclosed-arc and the mercury lamp produce light having very high actinic value, and the latter affords a considerable amount of natural diffusion. Concerning the lighting requirements, the various installations described by Mr. Smith consume from about 125 watts to 300 watts per sq. ft. of stage area. As a light producer the inclosed arc is conspicuously inefficient, but, photographically speaking, it is not bad, so that the actual amount of photographically effective illumination in all these instances is very high. The mercury lamps, and especially the quartz-tube lamps which have been effectively used in under-water moving-picture photography, are also extremely efficient photographic sources, an adequate amount of actinic light being provided in all cases. It is worth noting that we have no established conventional measure of photographic activity, so that the working illumination on the moving-picture stage cannot be stated in terms of anything definite. Yet the approximations given by the cases herein reported are sufficient to remove the matter from the domain of sheer empiricism and to enable lighting equipments to be designed with some certainty of results.

Indexing of Electrical Engineering Subjects

One of the disadvantages attending the extension of human knowledge is the correspondingly increased difficulty in classifying it. Anyone who has ever tried to classify information or data of any kind must have been impressed with the difficulties which frequently arise to perplex the innocent but well-intentioned classifier. The condition reminds one of the historical index which contained the item "Lord Brougham, his great mind, page 553." On the page of text referred to appeared the sentence, "Lord Brougham declared in council that he had a great mind to withdraw the bill." Some thirty years ago Mr. Melvil Dewey hit upon the felicitous plan of dividing all human recorded knowledge into ten classes, each identified by a numeral, namely, (0) general works, (1) philosophy, (2) religion, (3) sociology, (4) philology, (5) natural science, (6) useful arts, (7) fine arts, (8) literature, and (9) history. Under these heads came respective subdivisions likewise designated by decimals, and these subdivisions in turn became subdivided decimally. The process was capable of being carried on indefinitely, although human weariness usually asserted its prerogative at the end of the fifth digit, while some small library catalogs implied contentment with a subdivision of human knowledge carried as far as three digits only, where the decimal place is usually set.

The Dewey decimal system was logically constructed, and it has come into extensive use in general libraries. It has not, however, proved so welcome a guest in engineering libraries. At the date of its first introduction engineering was classified as a useful art, with numbers from 620 to 629 inclusive, as follows: engineering general, mechanical, mining, military, bridge, road, canal, river, sanitary, and other branches. Electrical engineering was stowed away under the wing of mechanical engineering, No. 621, and to it was allotted one decimal place thereunder, namely, 621.3. Telephones, however, came under 654—that is, under "communication."

The above classification of engineering subjects, however suitable it may have been originally, has in recent years been considered ill adapted to progress. If all electrical engineering has to start from a base of 621.3, how many significant digits must be carried in order adequately to include such topics as "squirrel-cage motors designed especially for elevator and hoist duty"? It is to be hoped that in the interests of simplicity, to say nothing as to the needs of a bewildered public, the decimal classification of engineering subjects may be carefully and authoritatively reconsidered in the near future. The need for readjustment does not imply any disparagement of the Dewey decimal system of classification. It merely means that in a world where progress and development occur readjustment of ordinance must inevitably take place. A world in which the rules are never altered, like those of the Medes and Persians, would be either a most distressful world or a stagnated world. Nothing known to humanity can escape change and the consequences of change.

Heterodyne Receiver Sensitiveness

In radiotelegraphy, and especially in transmission using sustained waves, attention is day by day becoming more closely directed to the Fessenden heterodyne receiver. This interesting fact is largely the result of widespread appreciation of the inherent qualities of the electrical-beats receiver, which the Navy Department has now begun to use quite extensively. The recent development of the oscillating audion, or "ultraudion," which has been described in our columns and which combines with the heterodyne principle a wonderfully sensitive amplifying action, has been instrumental in extending the knowledge of some of the heterodyne's possibilities.

The United States Navy tests from Arlington early in 1913, which were described in our issues for April 5 and June 21 of that year, first demonstrated to radio engineers generally the increased signaling ranges obtainable by use of the beats receiving method with the usual rectifiers of "wireless" telegraphy. Since that time there has been much speculation as to the actual amplification involved in heterodyne as compared with normal reception. General theoretical consideration of the problem is not complicated, and in his Institute of Radio Engineers paper, abstracted on page 1298 of our issue dated June 14, 1913, Mr. John L. Hogan, Jr., derived an expression indicating that the amplifying factor was equal to twice the ratio of locally generated to received currents.

On page 1039 of the present issue we print a theoretical paper by Mr. Marius Latour, in which the problem is attacked from a new angle. Mr. Latour considers the voltages impressed and shows that the ratio of response in heterodyne reception to that of normal operation may equal four times or 1.27 times the ratio of locally generated to received voltages. The choice of the numerical factor depends upon whether a complete or a partial theory is developed. It would appear that the conflict in coefficients between Mr. Latour's and the earlier results is caused by a difference in assumption as to what portion of the total interacting power goes to produce the heterodyne signal. The two theories are in agreement, however, as to the highly significant indication that heterodyne amplification is mainly dependent upon the ratio of applied to received power. This conclusion is in accord with all observed facts and shows that final response is probably limited only by the rectifier's load-carrying ability.

Experiments with a Plunger Electromagnet

In the ordinary operation of a plunger electromagnet it is customary to assume that the movement of the plunger core takes place in such a leisurely and comfortable fashion that not only its mechanical inertia but also the counter emf induced by the motion has no appreciable influence upon the strength of the delivered pull. Indeed, it often happens that the current strength is not greatly influenced by such counter emf. On the other hand, in the case of a reciprocating plunger electromagnet, such as an electromagnetic drill or electromagnetic hammer, the counter emf is relied upon to reduce the working current and also to improve the efficiency of the device. It may be shown that the maximum possible efficiency of such a reciprocating device is 50 per cent or only half that which an ideal motor-driven device could attain in the absence of friction. The remaining 50 per cent of the input goes into the magnetic circuit and must be dissipated when the plunger is released.

In the article on page 1037 Mr. B. C. Batcheller describes some experiments which bring into salient consideration the difference between the dynamic and the static pull of the plunger in an electromagnet, for the particular case in which the plunger is disconnected from any mechanical load save that offered by a sensitive recording device. An interesting element of the structure described in the article is a polar chronograph. This is not the first time that a polar chronograph of any kind has been disclosed, but its use in this case is evidently very appropriate and convenient. The chronographic recording chart is a flat sheet carried on a disk, driven at a substantially uniform measured speed by an auxiliary motor. This motor made about twenty revolutions per second, so that one revolution would occupy about one-twentieth of a second. Equi-angular distances on the chart thus correspond to equal intervals of time, while radial distances correspond to the actual distance traversed by the plunger. Any particular flight of the plunger will cause the recording style to trace out a certain corresponding polar spiral curve on the sheet, which can subsequently be transferred to rectilinear or Cartesian co-ordinates. The same type of chronograph is capable of being applied advantageously to many problems of rectilinear motion. The author shows that in the case considered the magnitude of the mean dynamic pull was only about half of that of the mean static pull over the same stroke.

LETTERS TO THE EDITOR

Factors in Rate-Making

To the Editor of the ELECTRICAL WORLD:

SIR:—In the article by Mr. Arthur S. Ives entitled "Factors in Rate-Making," in the March 27, 1915, issue, use is made of terms likely to be rather confusing to the novice. One of the factors enumerated by Mr. Ives is called "interweave" and defined as the ratio of station demand to sum of consumers' demands. This is neither more nor less than our old friend "diversity factor" under another name. Both the American Institute of Electrical Engineers and the National Electric Light Association have standardized this definition of diversity factor. Mr. Ives also makes use of what he calls "individual diversity factor," defined as the ratio of the consumer's maximum demand to his total connected load. This is the "demand factor" as given in the A. I. E. E. standardization rules. As both diversity factor and demand factor have come into general use in discussions of this character by central-station men and engineers, some confusion is likely to be created by the use of these factors under new names, which, although excellent and expressive in themselves, are not sufficiently well known to enable them to be interpreted without study.

Chicago, Ill. J. R. CRAVATH.

Criteria of Commutation

To the Editor of the ELECTRICAL WORLD:

SIR:—The article by Mr. J. F. H. Douglas on "The Criteria for the Quality of Commutation," appearing in your issue for March 6, is of particular interest to me, inasmuch as I derived a similar result from slightly different physical reasoning in the course of an article which appeared in your issue for June 29, 1912. My conclusion was that the condition that RT should be greater than L expresses the physical condition that the current density remains finite to the end of commutation, while the condition that $2RT$ should be greater than L expresses the physical condition that the rate at which energy is dissipated under the toe of the brush remains finite until the end of commutation. It was suggested that the latter is the more fitting criterion for good commutation.

The physical basis of commutation is a matter of such complexity that a contribution such as Mr. Douglas's, discussing it from a standpoint slightly different from the usual, is very welcome.

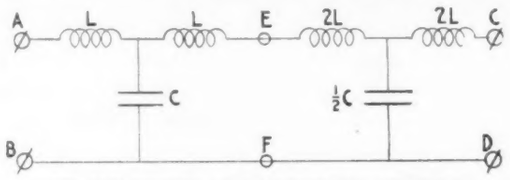
Rugby, England. F. W. CARTER.

An Electrical Paradox

To the Editor of the ELECTRICAL WORLD:

SIR:—Electrical "paradoxes" usually result from quite simple arrangements of apparatus, chosen with a view to produce a rather unexpected result or performance. However, when studied with a little care, the explanation proves to be quite simple. Let some apparatus be concealed in a box, and only two pairs of terminals be visible or accessible. When an emf of 110 volts at a frequency of sixty cycles is impressed upon one pair of terminals an emf of 220 volts is measured across the other pair of terminals. If in addition a load of, say, 10 amp is drawn from the 220-volt terminals, it will be found that 20 amp is drawn from the supply at practically the same power-factor as the load and with only a slight falling off in the voltage at the load.

If one were asked to tell how the apparatus was being used, he would probably say as a transformer. He would doubtless be much surprised to find, upon opening the case, only some electrostatic condensers and choke coils. The combination shown in the sketch will be found to imitate a transformer in every way at a frequency f such that $2\pi f = 1 \div \sqrt{LC}$. This fact can easily be proved by means of complex quantities or by assuming the combination reduced to an equivalent resistance



ARRANGEMENT OF ELECTRICAL CIRCUITS

and reactance. Use is made of nothing but two T-connected resonating circuits, of different impedance ratios, joined in series. The currents at the points E and F will be found to vary only with the impressed voltage, and not at all with the load current. The whole phenomenon is one of resonance, though resonance of a somewhat unusual and novel kind.

Ames, Ia. JOHN F. H. DOUGLAS.

Selecting Lighting Units on the Basis of Results

To the Editor of the ELECTRICAL WORLD:

SIR:—Your editorial on the subject of "Incandescent Versus Arc Lamps" in your issue of April 10 touches on many points of practical value, and it is certainly refreshing to note that you do not advocate the immediate replacement of *all* arc lamps by the new nitrogen-filled tungsten units. This course is too often thought the proper one by persons who have made no careful study of the subject or whose study has been based upon the manifestly unfair comparison of the oldest type of arc lamp with the latest developments in incandescent lighting.

The vital question, as you state, relates to the extent to which the substitution of nitrogen units for arc lamps is justified. Surely the reply can be only on the basis of efficiency, rather than from considerations of what may appeal to the imagination of the man on the street as a new thing worthy of encouragement. The advance made in arc-lamp construction and efficiency since Sir Humphry Davy in 1808 with a very primitive device demonstrated that an electric arc could be continuously maintained in air has certainly been as great as, if not greater than, the huge strides made in the incandescent-lamp industry. That the efficiency of the open-type flaming-arc lamp is still two to three times as high as the latest claims for the nitrogen-filled unit is proof of this fact, and the latest form of arc should therefore be equally worthy of encouragement.

The replacement of arc lamps by incandescent units does not always mean better lighting. With the imperfect illumination midway between lamps often found in American practice, the possibility of creating by substitution (occasionally at a meager saving) a condition worse than that existing originally should be very carefully avoided, as clearly pointed out by you. It is at present impossible, if we are to have good illumination, to make the radical improvement necessary in street or industrial lighting, with tungsten lamps of

400 cp spaced 150 ft. apart, or of 600 cp spaced 300 ft. apart. The basis of calculation, instead of being taken as candle-power at various points or as flux of light expressed in lumens per lighting unit (which may or may not mean anything), should be taken on a foot-candle basis—i. e., the result obtained upon a horizontal surface, either street or working level. Or, in other words, we should judge the efficiency of our lighting units in the way that we judge most other things, namely, on the results obtained. At the same time, the psychological effect, steadiness and distinctive character of the open-type flaming arc should not be overlooked.

C. H. CHAMPION,
General Manager
Kandem Electric Company, Inc.

New York, N. Y.

Rates and By-products

To the Editor of the ELECTRICAL WORLD:

SIR:—Some interesting questions are likely to come before public utility commissions in rate-regulation cases during the next few years in connection with by-products. Commissions generally have the power of regulating both electric and steam-heating rates since these services partake of the nature of a public utility. In the numerous cases where electric-service companies operate ice plants in connection with electric plants the situation is different. The manufacture of ice is not subject to regulation. Although ice is a general public necessity in many communities, it is manufactured and sold under competitive conditions, as is food or merchandise. The manufacture, not being a monopoly, is not subject to price regulation like a public utility which is virtually a monopoly.

In many cases the ice manufactured by a central-station company is practically a by-product. As a result of such combination it frequently happens that the profits on the whole undertaking are considerably more than they would be on an electric plant of the same size operated alone, plus an ice plant of the same size operated alone. The interesting question for commissions to decide will be as to the profits to be allowed on the investment in such combination plants. Has the public any right to reduced rates because the two plants are operated together and therefore more economically?

Evidently much is to be said on both sides of this question. From the side of the public it might be argued that the manufacture of ice as a by-product is simply one of the steps in the modern economy of production of electric energy, and that the public is entitled to part of the benefits of such economy in the shape of a reduction of rates just as if this economy were brought about by the introduction of modern steam generating equipment to replace older and less economical types. On the other hand, the companies could argue that since they had the foresight to combine the manufacture of ice as a by-product with the supply of electric energy any unusual profits resulting from such a combination should go to the company, and that the public should be entitled to a rate for electric energy which would yield a fair return upon the investment in an electric plant of the same size operated alone. It could also be maintained that since the manufacture of ice is competitive and not under control of the commission the public should have nothing to say regarding the profits of this side of the business.

There is evidently much justice in both arguments, and it would not be strange if future commission decisions were to steer a middle course between the two. While the electric plant may be operated more cheaply when part of its expenses are assumed by the ice plant, yet it is true that the ice plant is operated at a greater profit because of its connection with the electric plant, and the ice department is thus deriving benefits from a public utility property. The benefit is mutual.

Another interesting question in rate-making where by-products are concerned is in connection with rates for "off-peak" or limited contracts where the consumer agrees to refrain from using energy during certain peak-load hours and in consideration thereof is given a lower rate. Now, if the rate is based on the cost of service, a certain portion of such a consumer's bill will consist of a demand charge which is intended to cover interest on the investment needed to supply energy to the consumer. Since part of this investment has already been made in order to serve some other consumer during the peak-load portion of the day, the question arises whether the off-peak consumer should be charged with the fixed charges on any of the equipment used for the peak consumer.

One method would be to divide the fixed charges between the off-peak-period and the peak-period consumers. Thus, if the off-peak consumer in question had a maximum demand of 100 kw, he would be charged with one-half the fixed charges on the investment necessary for 100 kw of power station and feeder equipment, leaving the other half of the fixed charges to be borne by peak-load consumers at regular rates. Another basis of making the rate would be to charge the off-peak consumer none of the fixed charges on the investment in equipment used by other consumers during the peak. Such a procedure can be defended on the ground that the investment has to be made for the peak period consumers in any event without regard to whether or not the off-peak contract is made, and that the company is entitled to sell its available output to the off-peak consumer during off-peak periods without making him pay any of the fixed charges. In other words, the electric-service company could argue that the extra generating-station equipment needed only during the peak-load period is a by-product at other hours which it is privileged to sell at a price to meet competition.

If a company should take the above position, assuming that the off-peak consumer rate is sufficient to yield a profit on the kilowatt-hour output and upon any investment made specially for such a consumer, it would undoubtedly make more money than if the off-peak consumer were not obtained. The question appears to involve justice between the two classes of consumers. It might be difficult to show the justice of charging the peak-load consumer with the fixed charges upon the apparatus which he has reserved for his use three hours per day, and of omitting these charges against some off-peak consumers with the same maximum demand using the same station equipment and investment the other twenty-one hours. If the central-station company can get the off-peak business by dividing fixed charges between the off-peak and the peak consumer, the equity of such an arrangement cannot be questioned. The possible dispute arises when it becomes necessary to omit the demand charge of the off-peak consumer covering apparatus used also by other consumers in order to meet competition and secure business. Suppose it is a case of securing off-peak business at a purely by-product rate or of not getting it at all, the company will make money and the other consumers will not lose. That is to say, the regular peak-period consumers will pay no more than if this off-peak business were taken at the by-product rate with the demand charges omitted on the portion of the central-station investment used for both consumers. In the long run such contracts would be beneficial for all consumers because they would tend to improve economy of production, which, in the end, would result in reduced rates.

J. R. CRAVATH.

Chicago, Ill.

Electrical Standards

Mr. H. M. Hobart and Mr. C. E. Skinner, who were sent to London as delegates from the American Institute of Electrical Engineers to confer with the standards committee of the Institution of Electrical Engineers of Great Britain in February, completed their work on March 25 and will make their formal report to the standards committee of the A. I. E. E. on May 7. It is understood that Mr. Hobart and Mr. Skinner will report that their mission was successful and that substantial agreement between the standards of the two countries has been reached.

Sir John Snell, president of the Institution of Electrical Engineers, formally welcomed the delegates, and Dr. R. T. Glazebrook, director of the National Physical Laboratory, acted as chairman of the conferences, which were held at the home of the Institution of Civil Engineers in London. Every possible courtesy was shown to the American delegates, and there was ample evidence of the earnest desire of the British standards committee to arrive at a complete agreement.

It is expected that through their study of both sets of rules with the British committee the delegates will be able to make important suggestions for the clarification of the American rules. It is also thought that they will make certain recommendations for changes in the American rules in order to arrive at closer agreement than would otherwise have been possible.

While there probably will still be minor differences to be settled, and while the wording of the two sets of rules will be different in many respects, it is expected that in all essential points the machinery built in accordance with either set of standards will fulfil the same specifications.

New Grade of Members in I. E. S.

In accordance with certain proposed changes in the constitution of the Illuminating Engineering Society, upon which a vote is soon to be taken, a grade of associate member is to be created into which members will pass automatically, except general officers of the society and members of the general board of examiners, who will pass automatically into the new grade of member. A member must be not less than twenty-three years of age and shall have been engaged for at least three years in work having a direct bearing on illuminating engineering or shall have made some valuable contribution to the science or art of illumination. The annual dues for associate members will be $5, and for members $10.

The committee on constitutional revision, of which Mr. W. D. Weaver is chairman and Dr. C. H. Sharp is secretary, has sent a letter to the membership in which it is stated that when the society was organized in 1906 illuminating engineering as such was practically unknown. The principles and data of illumination had not been assembled, and there was not only an entire lack of co-operation between those engaged in the various arts dealing with illumination but frequently their relations were sharply antagonistic and even distinctly unfriendly. The society brought together the elements that previously confined to their own coteries the scientific and technical knowledge that they acquired. It has secured world-wide recognition, and its existence has led to the organization of similar bodies in England and Germany.

The lack of gradation in membership puts the society under a handicap that deprives it of the full recognition to which its objects and achievements entitle it. Gradation will also increase the present inadequate income. Several years ago the acute situation as to income was met by a constitutional provision for sustaining members, consisting of corporations, firms, associations, etc. About 28 per cent of the income is now derived from this source. While this aid has been given and received without influencing the conduct of the society in any manner, the society should be entirely self-supporting.

In nearly all, if not all, societies having several meetings a year and issuing transactions the dues are much higher. The society is operated economically, but the transactions, committee work, the large number of sectional meetings and the annual convention make the total expenses approximately $8 per member. Many members want to meet their costs, and the proposed plan will do this. A committee appointed to consider membership gradation and increased income recommended the changes.

In the letter, which has been approved by the council, it is stated that without doubt the qualifications for the grade of member will be subject in time to further amendment applying closer discrimination, but they are made light now in order to render eligible to transfer as large a proportion of the membership as possible.

Iowa Central-Station Men Discuss Gas-Filled Lighting and Small-Customer Business

Interest in the sessions of the fifteenth annual convention of the Iowa Section of the National Electric Light Association at Keokuk, Ia., April 20, 21 and 22, centered chiefly on discussions of gas-filled tungsten lamps, workmen's compensation insurance, rural electric service, rate-making, central-station facts and factors, and general commercial and financial topics. The discussions of authors' papers were very thorough, and several times during the convention such discussions were, at the suggestion of President Rufus E. Lee, of Clarinda, turned into "experience meetings" which brought out practical solutions for many utility operators' problems.

That the great majority of Iowa operators are experiencing marked success with gas-filled tungsten street-lighting lamps was evident from the discussions and from the flood of questions poured in upon speakers on this topic. Many managers now operating arc-lighting systems are contemplating changes to the newer type of illuminant.

Opinions regarding the advisability of carrying workmen's compensation insurance differed, but all agreed that the Iowa compensation law is in general beneficial to both the employees and the companies.

In the possibilities of securing business from rural transmission lines everyone appeared interested, and extended discussions on this subject showed that nearly forty Iowa plants are now making efforts to get farm customers.

Discussion of the "small-customer" problem showed that while some Iowa companies favor the use of current-limiting devices to secure the business of small-residence consumers, others have had no success with this system. The general sentiment, however, seemed to favor conservative use of flat-rate controller devices. One enthusiastic manager stated that his company had been able to increase its gross earnings by $5,000 per annum in a town of 40,000 inhabitants by the use of a controlled flat-rate plan.

The revised "facts and factors" report containing data on the operation of sixty-four Iowa central stations was enthusiastically received, and the committee on facts and factors, consisting of Messrs. Austin Burt of Waterloo, F. A. Fish, and H. W. Wagner of Ames, was reappointed.

General Electric Company Annual Report

The value of orders received by the General Electric Company in 1914 was $83,748,521, as compared with $111,819,142 in 1913. Sales billed aggregated $90,467,692, as compared with $106,477,439 in 1913. Profits from sales were $8,970,963, as compared with $10,269,605. Income from other sources was $2,884,420, against $3,796,184 in the previous year. The total income in 1914 of $11,855,384 compares with $14,065,789 in 1913. After payment of interest and dividends the balance carried to surplus was $3,145,060 in 1914 and $4,908,674 in 1913. Total surplus stood on Dec. 31, 1914, at $20,084,879. The condensed profit and loss account is published in Table I.

TABLE I—CONDENSED PROFIT AND LOSS ACCOUNT

Sales billed		$90,467,691
Less: Cost of sales, including all operating, maintenance and depreciation charges		81,496,728
		$8,970,963
Interest and discount	$1,306,876	
Income from securities owned	1,313,989	
Sundry revenues	263,555	
	$2,884,420	
Less: Interest on debenture bonds	567,556	
		2,316.864
		$11,287,827
Dividends paid		8,142,767
Net surplus for the year		$3,145,060
Surplus at Jan. 1, 1914		16,939,819
Surplus at Dec. 31, 1914		$20,084,879

Mr. C. A. Coffin, chairman of the board of directors, observes that, in common with commercial interests generally, the business of the company experienced marked contraction during 1914. Had not a large volume of unfilled orders been carried over from 1913 the effect of the general depression would have been still greater. While there was a decrease of about 25 per cent in the value of orders received, the total number of transactions was practically equal to that of the previous year. The unfavorable relation between the number of orders and their value, characteristic of periods of depression, operated to increase materially the cost of securing and handling business.

As a result of business contraction the number of employees engaged in the factories and offices and in those of subsidiary companies at the end of 1914 was about 15,000 less than in the previous year. The company followed its customary practice in writing off against income account its total expenditures in 1914 for patents, applications, licenses under patents and other outlays relating thereto, amounting to $408,537. The patent account is, therefore, carried still at $1.

Stocks, bonds and other securities are carried at a valuation of $29,667,213, of which $21,056,354 represents securities of subsidiary companies and $8,610,859 the securities of public utility and other companies. Current accounts and notes receivable are carried at $19,091,026. They have been appraised carefully by a special committee, and the reserves for depreciation thereon are regarded as adequate, the report adds.

The manufacturing floor space was increased by 940,000 sq. ft. during the year, but most of this construction was under way when the year began. Expenditures during the year for additions and improvements to manufacturing plants aggregated $6,006,955, and the amount written off was $4,370,793. On Jan. 31, 1893, the book value of the Schenectady, Lynn and Harrison plants was $3,958,528. During the twenty-two fiscal years to Dec. 31, 1914, expenditures have been made, including the cost of the Pittsfield, Erie, Fort Wayne, Sprague and National Lamp plants, aggregating $75,321,586, making a total of $79,280,114. There has been written off during the twenty-two years $48,216,783, leaving the book value of the plants at Dec. 31, 1914, at $31,063,331. A summary of the changes in manufacturing plants account since the last annual report is given in Table II.

TABLE II—CHANGES IN MANUFACTURING PLANTS ACCOUNT

	Net Book Value Jan. 1, 1914	Additions During Year	Written Off	Net Book Value Dec. 31, 1914
Real estate and buildings	$18,766,294	$3,317,357	$1,192,832	$20,890,819
Machinery	10,660,872	2,273,124	2,761,486	10,172,510
Patterns	1	50,706	50,706	1
Furniture and fixtures	1	365,769	365,769	1
Total	$29,427,168	$6,006,956	$4,370,793	$31,063,331

The capital stock of the company outstanding on Jan. 1, 1914, amounted to $101,381,200. During the year $14,800 additional stock was issued upon conversion of debentures of 1892 and $89,700 upon conversion of debentures of 1907, making the total capital stock issued $101,485,700. Quarterly dividends at the rate of 8 per cent per annum were paid during the year. The company has no note payable, nor is there any paper outstanding bearing its indorsement.

Mr. Coffin makes special mention of the fact that changing business conditions and methods placed upon executive officers, engineers, factory and commercial managers and their associates problems more perplexing and burdens more difficult than usual, and they have discharged their duties with such fidelity, intelligence and courage as to entitle them to the sincere thanks of the board of directors.

Value of the Service in Rate-Making

A letter discussing the value of the service theory in rate-making has been received by Mr. R. S. Hale, chairman of the rate research committee of the National Electric Light Association, from Mr. H. H. Holding, general power representative of the Public Service Electric Company of Newark, N. J. In the letter, expressing his personal views, Mr. Holding says:

"It is not surprising that the rates at which central-station service is sold are so varied. When an exact cost of service is sought there are as many solutions to the problem as there are investigators. This statement is not a reflection upon the ability of the students of the rate problem, but merely a proof of the existence of variables whose value under a certain set of conditions is largely a matter of opinion.

"It is generally agreed that the elements of cost of service can be grouped in two divisions, first, those elements which have a fixed value, and, second, those elements which have a varying value.

"The first group usually contains the investment charges, such as interest, depreciation, amortization, obsolescence, taxes, insurance, etc. The second group includes labor, fuel, transmission losses, etc. In both these are elements which vary in different localities and also vary under different sets of conditions in the same locality.

"It is true that after a certain method of accounting is agreed upon a cost per unit can be obtained for a given period of past performance, but output will increase or decrease, and the number of customers will

change and the use of existing service connections will vary; therefore, unless an exact prediction can be made for a future period, the cost for such future period cannot be determined exactly.

"Such uncertainty therefore makes impossible an exact determination of cost per unit of central-station service, and will undoubtedly make a uniform rate for more than adjacent and restricted territories impossible.

"The cost of production in the central-station industry follows very closely the law governing the cost of production of any manufactured product. There are some limiting features, however, which restrict the central station and make investment in it even more hazardous than in the other industries.

"Some of these features are: (1) limited number of customers; (2) inability on account of quasi-public nature of the business to choose or reject undesirable customers; (3) the product must be produced within a limited distance from the customer; (4) periodic variations of rate cannot be made easily to suit changes of cost conditions; (5) many individual customers must be served at a loss; (6) product cannot be stored.

"It would seem that the selling price of central-station energy should be based upon the same laws which govern the selling price of any other manufactured product, namely, value of the product to the customer.

"The manufacturer of a given useful product knows that the extent of his sales largely determines his cost, and the value of his product to his customers as a whole determines the demand and therefore the sales.

"The management of a central-station property should be allowed to adjust the rate for the sale of service in just the same way. Because of the restrictions under which it operates it should be allowed to expand its business by selling more energy and service and so increasing the earning power of the investment by a longer-hour use of the equipment.

"Before adopting a rate, however, a careful study of the true value of service to the customer should be made, and the rate when adopted should be chosen with an understanding of its possible effect upon the earning power of the investment."

Annual Report of Southern California Edison Company

Business conditions in California are discussed at length in the annual report of the Southern California Edison Company, Los Angeles, Cal., for 1914.

Mr. John B. Miller, the president, says that financial conditions seemed to be fairly normal during the winter and early spring and to be somewhat recovered from the Balkan war disturbance, but a little later several notable failures in England and the United States seemed to point to such possible weakness that it was decided to revise again plans for expansion originally decided upon for 1914 and to curtail expenditures for all purposes, including new business, to the lowest point consistent with safety and a due regard for the public. The company had commenced to receive the benefit of the heavy expenditures during the last few years in increased economies and efficiency of operation, so that, notwithstanding the disturbed and depressed conditions, it was able to show a gratifying increase in net earnings.

The present disturbed financial conditions throughout the world make it impracticable, Mr. Miller says, to depend upon estimates of earnings for 1915, but he calculates upon at least as good a showing in comparison with 1914 as 1914 made compared with 1913.

Mr. W. A. Brackenridge, vice-president and general manager, says in his report that the transmission lines damaged by the unprecedented storms of the year have been entirely repaired at moderate cost and are now in good operating condition. Line extensions for new business have been greatly curtailed owing to the financial depression.

In speaking of the issue of $6,500,000 bonds voted by the people of Los Angeles for the acquisition of a distributing system in the city, Mr. Brackenridge says: "None of these bonds have been sold and consequently no progress has been made on the construction of the power plant. The city officials as a preliminary step have asked the Railroad Commission to place a value on the distributing system of this company, with a view to purchase by the city or acquisition by eminent-domain proceedings of that portion lying within the limits of the city of Los Angeles; and, inasmuch as the law provides that just compensation shall be made for all property taken, the assumption seems justified that this compensation will include all values as a going concern in addition to that found by inventory. The commission is proceeding with the valuation of this company's property within the city of Los Angeles and such other of the company's property as may be affected."

The extension of jurisdiction of the Railroad Commission to all territory within the State will result, Mr. Brackenridge believes, in more satisfactory adjustment of relations with the community. During the year the United States Supreme Court rendered a decision with reference to rights of holders of constitutional franchises which secures to the company in perpetuity a blanket franchise over all of the streets within the limits of any incorporated cities in which it was operating prior to Oct. 10, 1911.

In effecting economies it was necessary to reduce forces very materially in both operating and construction departments, throwing an extra burden upon many of those retained. This emergency was met by employees in a cheerful spirit and with characteristic loyalty, and this contributed very largely to the satisfactory financial showing.

Mr. S. M. Kennedy, general agent, reports that extensions to the distribution systems have been made along conservative lines, due consideration being given to the disturbed financial conditions and the obligations to take reasonable care of the requirements of communities. The company put into effect on March 1, 1914, a general reduction in lighting and motor-service rates. The reduction in lighting rates was followed by added consumption of energy caused by increased and freer use of electric household devices. Owing to industrial conditions, there has been no corresponding increase in consumption of energy for motor service. It is expected that the same schedules will continue through 1915.

Mr. Kennedy adds that notwithstanding the large additions to consumers and the difficulties which restricted expenditures necessarily develop, relations with customers and the general public are very satisfactory.

At the end of December, 1914, the company and its subsidiaries had 143,886 consumers, an increase of 14,553 for the year. In spite of business depression during 1914, the company closed agreements for service to 1778 new motor-service customers, aggregating 26,258 hp. Additional lighting business during the same period amounts to 285,355 50-watt equivalents. The company sold to its customers 27,081 electrical appliances. The combined additional connected load contracted during 1914 amounts to 47,007 kw. As financial conditions improve and business becomes more normal, the additional load contracted should become more active and be reflected in substantial increases in gross earnings.

Substation of Lancaster Edison Company

Compact Arrangement of Transformer and Switching Equipment for Control of Transmitted Energy

THE electrical energy for operating railways and for industrial, commercial and domestic uses in the city of Lancaster, Pa., and its vicinity has heretofore been supplied from the Engleside steam station of the Edison Electric Illuminating Company in Lancaster. Additional energy from the Slackwater hydroelectric station near the city has also been distributed from this steam station.

In order to reduce the cost of production and to provide for the increased demand, energy is transmitted from the hydroelectric station of the Pennsylvania Water & Power Company at Holtwood on the Susquehanna River, approximately 20 miles away. The line voltage is stepped down from 66,000 to 2300 for distribution. An outdoor station near the steam station and the new substation contain the step-down transformers, high-tension oil switches, disconnecting switches and protective apparatus for the incoming lines. The present transformer equipment comprises four 3000-kva units, including one spare unit. Provision has been made for a duplicate bank so that the ultimate rating of the station will be 18,000 kw.

The Engleside Plant

The original Engleside plant was built in 1893 by the Citizens' Electric Company. The Edison Electric Illuminating Company was incorporated in the year 1886 and operated a plant on Arch Street near Lemon. In 1895 this latter company purchased the Engleside plant, which was enlarged from time to time to keep pace with the constantly growing demand for electrical energy.

In 1912 a complete new switching equipment was installed in the new substation, with an outdoor station and transmission line complete for purchasing energy from the Pennsylvania Water & Power Company.

The new substation is adjacent to the steam and outdoor stations and contains frequency-changer sets, the step-up transformers, electrically operated switching equipment, and the protective apparatus required for the distribution of the electricity from those two stations. The steam station and the new substations are connected by a tunnel through which all the cables are carried. The connecting cables from the outdoor station are lead-covered and are run in fiber ducts up to the point where they enter the tunnel. All cables from the steam station are braid-covered and flame-proof and are run open on racks.

Installed in the steam station at present are four 1000-kva engine-driven units and one 3000-kva turbine unit with provision for a future 5000-kva turbine unit. An additional 1000 kva is available from the Slackwater incoming line, making a total of 31,000 kva which will ultimately be connected to the substation busbars. This is all 2300-volt, three-phase, twenty-five-cycle energy.

Distribution of Energy

The energy handled by the substation is distributed as follows: Eight 2300-volt, three-phase, twenty-five-

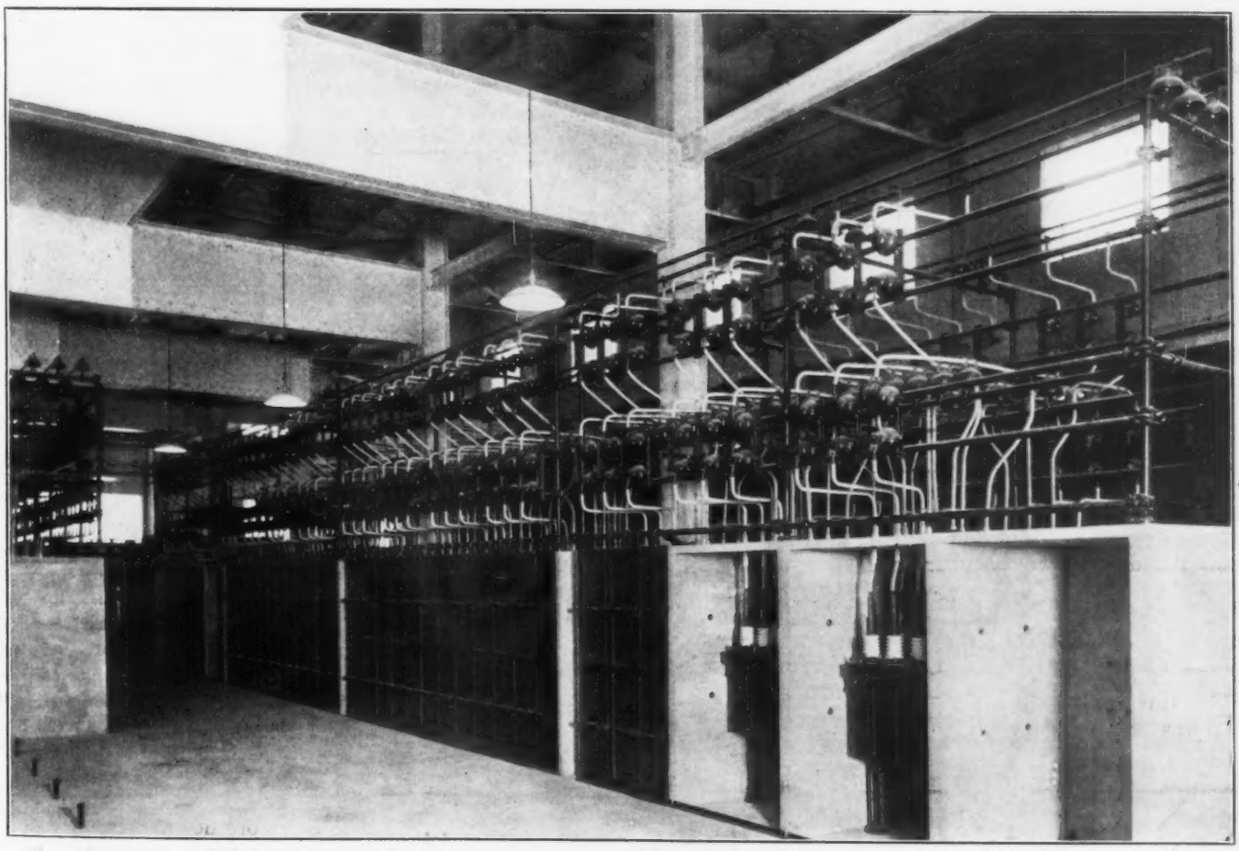


FIG. 1—CIRCUIT-BREAKER CELLS AND BUS STRUCTURE, ENGLESIDE SUBSTATION

cycle feeders (four future ones) direct from the main busbars to the various rotary-converter substations in the city. Two 6600-volt, three-phase, twenty-five-cycle feeders for the linoleum works of the Armstrong Cork Company, near Lancaster, supplied through two 1800-kva step-up transformer banks; these feeders have no breakers on the 6600-volt side, disconnecting switches

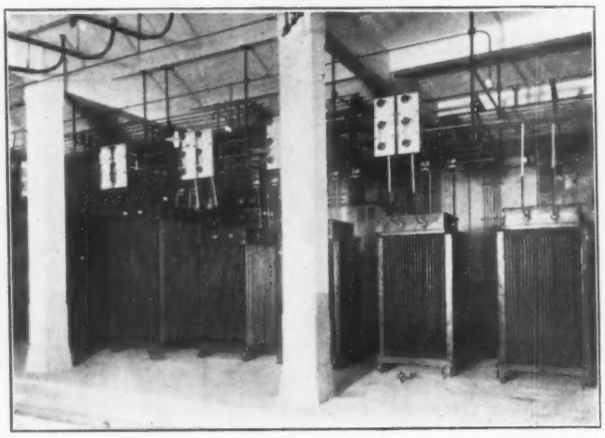


FIG. 2—TRANSFORMER EQUIPMENT OF ENGLESIDE SUBSTATION

only being used. Sixteen 11,000-volt, three-phase, twenty-five-cycle feeders (five future ones) supplying rotary-converter substations in the outlying districts fed from two step-up transformer banks, one rated at 900 kva and one at 2250 kva; provision has also been made for a future duplicate equipment. Twelve 11,000-volt, three-phase, sixty-cycle feeders (eight future ones) for supplying substations throughout the district, supplied through two 1250-kva frequency-changer sets—2300 volts, three-phase, twenty-five-cycle, to 2300 volts, two-phase, sixty-cycle—and two banks of 800-kva T-connected step-up transformers; provision has been made for two future duplicate frequency-changer sets and one future duplicate transformer bank. Twelve feeders (two future ones) from the two-phase frequency-changer busbars, 2300 volts, single-phase, sixty-cycle, for lighting circuits in the city; space has been provided for the future installation of induction regulators in these feeders. One 2300-volt, three-phase, twenty-five-cycle feeder direct from the main busbars supplies a motor-driven exciter set and various auxiliaries in the steam station.

The substation lighting and the control battery-charging sets are supplied from two 10-kva, 2200/110-volt, single-phase, twenty-five-cycle step-down transformers fed from the auxiliary busbars for the frequency-changer sets.

Station Equipment

The main floor of the substation is occupied by the frequency-changer sets and step-up transformers. The exciter and field switchboard, the motor-starting equipment, the 2300 volt, three-phase, twenty-five-cycle and the 2300-volt, two-phase, sixty-cycle circuit-breaker structures for the frequency-changer sets are on this floor, the circuit-breakers and rheostats being electrically operated from a fourteen-section control desk on the second floor.

A spare transformer of each size is provided, and the usual double-throw disconnecting switch scheme for readily cutting in this spare unit is employed. The necessary busbars for delta connections, spare transformer, etc., are of hard-drawn copper rod insulated with micarta tubing and supported on 1¼-in. pipe framework hung from the ceiling. Disconnecting switches are provided on both low-tension and high-tension sides between transformer banks so that a bank may be transferred to a feeder other than that on which it normally operates.

All transformers are equipped with flanged wheels, and rails are laid in the floor so that by means of a transfer car any transformer may readily be removed and brought under the crane for the purpose of inspection or repair.

A transformer oil-piping system with oil filter and tanks for clean and dirty oil has been installed, the tanks being in a pit outside of the station.

A storage battery which supplies energy for operating circuit-breakers, rheostats, graphic meters and other devices is installed in a room on the main floor. The sixty-cell battery has a rating of 160-amp-hr. and is charged from a 5-kw, 150-volt motor-generator set on the second floor. The battery has sufficient capacity to carry the emergency lighting circuit for a time if required, and an automatic throw-over switch is installed on the local service board to transfer that circuit to the battery in case of interruption of the alternating-current circuit.

When the steam station is in operation the control circuit is normally taken from the exciter busbars. An automatic change-over switch connects the control circuit to the battery when the exciters are shut down and the transmitted energy alone is being used. The cable connections between switch structures and the frequency-changer sets are carried in fiber conduit laid in the floor. The connections to the transformers are run overhead.

There is a double set of 2300-volt, two-phase busbars, each circuit having two breakers electrically interlocked so that both cannot be closed at the same time, and with disconnecting switches on both sides of each breaker. The second floor carries four control desks, a local service and recording meter board, the control board for the outdoor station, the battery-charging set, and three circuit-breaker and busbar structures.

A fourteen-section desk controls the frequency-

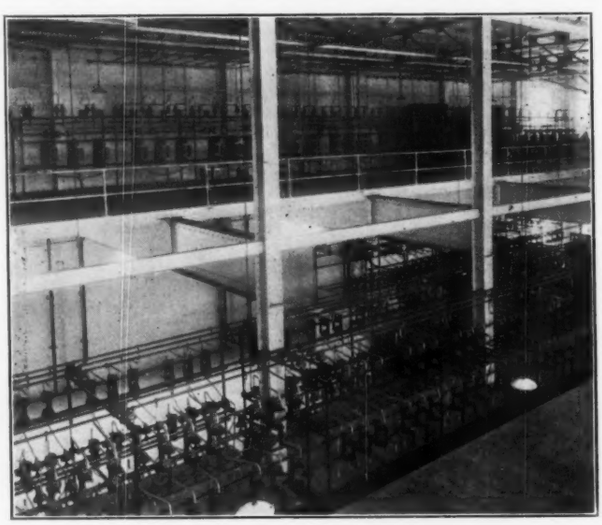


FIG. 3—BUSBAR STRUCTURE AND 11,000-VOLT CIRCUITS

changer sets, sixty-cycle step-up transformers (2300-volt side only), and the single-phase outgoing feeders, the structure for the circuit-breakers being on the main floor.

The other three desks shown in Fig. 4 control the 11,000-volt, sixty-cycle, the 11,000-volt, twenty-five-cycle, and the 2300-volt, twenty-five-cycle circuits re-

spectively. These desks are of the open type with relays mounted on the rear sections.

The switching equipment in the 2300-volt, twenty-five-cycle structure is mounted on pipe framework built in concrete cells, which inclose the breakers, disconnecting switches and instrument transformers belonging to one circuit. The busbars are of bare cop-

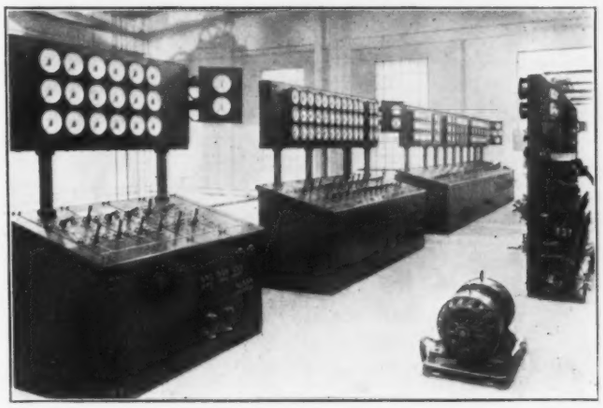


FIG. 4—CONTROL BOARDS FOR SIXTY-CYCLE AND TWENTY-FIVE-CYCLE SYSTEMS

per strap supported on a pipe framework above the breaker cells and are separated and covered by asbestos lumber. Fig. 3 shows a top view of a portion of the structure.

The 11,000-volt structures have only the breakers inclosed in concrete cells with the disconnecting switches and busbars in the open supported on pipe framework above the breaker cells. The busbars are of hard-drawn copper rod insulated with micarta tubing. The series transformers are mounted in the switch cells. Two shunt transformers are connected to each set of busbars for operating feeder watt-hour meters and reverse-power relays. Pallet switches on the circuit-breaker mechanisms automatically connect the meter and relay voltage circuits to the transformers on the busbars to which the feeder is connected. Fig. 1 shows these structures.

The 11,000-volt feeders are carried from the switch cells to the choke coils on the third floor by triple-conductor cables in iron conduit running under the ceiling of the first floor and up the station wall.

Electrolytic lightning arresters and choke coils are provided for all outgoing feeders from the substation and are mounted on the third floor. All feeders go out overhead.

All automatic circuit-breakers, when opened automatically, ring a bell, the circuit of which is closed through a bell relay, which is in turn actuated by the breaker-tripping energy that passes through the main relay contacts. Push-buttons are provided to open the holding-coil circuit of the bell relay and stop the bell from ringing.

The station is compact, considering the capacity and the amount of apparatus installed, with ample room between the various pieces of apparatus. As all the requirements of the present installation and the contemplated future extensions were known, it was possible to lay out the station to advantage.

The electrical equipment, the contract for which included the design and supervision of erection of the building, was supplied by the Westinghouse Electric & Manufacturing Company. The original plans were drawn up under the direction of the late Mr. C. Edgar Titzel and were carried out by Mr. R. B. Hull, who succeeded him as manager.

ENERGY FLOW AND MAGNETIZING FLOW

A New Graphical Method of Analyzing Alternating-Current Phenomena

A new graphical method of showing the functions of alternating-current apparatus, generators, motors, transformers, transmission lines, etc., by analyzing the energy flow through them into two ribbons of flow, one representing energy proper and the other the magnetizing power, was described by Mr. Robert A. Philip, electrical engineer for the Stone & Webster Engineering Corporation, Boston, Mass., in a paper presented March 22 before a joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the electrical section of the Western Society of Engineers.

In every alternating-current system the two kinds of power described coexist and flow independently. They may flow in the same or in opposite directions, and either flow may vary without interfering with the other flow.

Visualizing Energy and Magnetizing Flows

One may picture the variations in the two ribbons of power from a generator as follows: The operator can with his right hand increase, decrease, stop or reverse the flow of the ribbon of energy by opening and closing the engine throttle or governor controller, while with his left hand he may similarly and independently control the ribbon of magnetization by raising or lowering the excitation by the field rheostat.

Fig. 1 shows the flow of power through a transformer. The transformer diverts from the energy stream a small branch which is consumed as transformer loss and from the magnetizing stream another small branch which magnetizes the core. Even at no load, the transformer must receive these two small streams if it is active. Ordinarily both streams come from the same direction —that is, from the generator—but this is not essential, for when an induction generator drives a synchronous motor through the transformer the energy-loss stream comes from the generator and the magnetization stream from the motor.

While energy flow and magnetizing flow can be considered to exist in the same circuit practically inde-

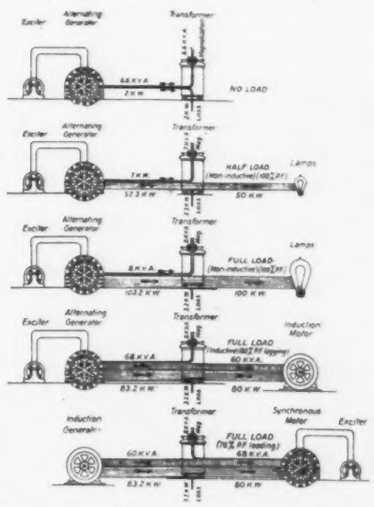


FIG. 1—FLOW OF ENERGY AND MAGNETIZATION THROUGH A TRANSFORMER

pendently, there are not, of course, two distinguishable currents of electricity in the same wire. Neither the current nor the pressure alone shows any trace of the two components of which either may be considered to be built up. However, on comparing the composite current with the composite pressure it is found that the times of reversal are no longer either simultaneous or

in quadrature. The effect on current and pressure of combining energy and magnetizing flow is to shift the relative time of reversal, or, as it is ordinarily expressed, the phase is shifted.

Use in Computing Resultant Power-Factor

When the phase of current and pressure is the same

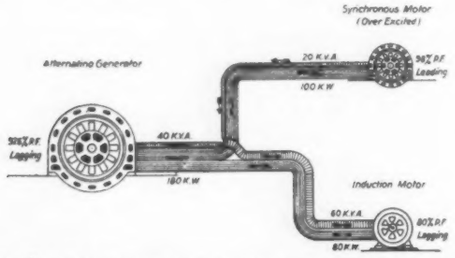


FIG. 2—POWER-FACTORS FOR BRANCHED CIRCUIT

the apparent power is the same as energy flow; when phases are in quadrature it is the same as magnetizing flow. For intermediate phases apparent power consists of an energy-flow component and a magnetizing-flow component. It is found that the square of the apparent power is equal to the sum of the squares of the energy flow and the magnetizing flow.

Where a circuit branches, say from one generator to two motors operating at different power-factors, the determination of the power-factor of the generator from that of the motors looks rather complicated. The same problem is extremely simple if viewed as the division of two kinds of currents each into two branches.

For example, the generator in Fig. 2 supplies an induction motor taking 80 kw at 80 per cent power-factor lagging, and a synchronous motor taking 100 kw at 98 per cent power-factor leading. It is evident that the generator supplies the sum of 80 kw and 100 kw, or 180 kw, but it is not very obvious that its power-factor is 97.6 per cent lagging.

Fig. 2 shows that this complicated relation of power-factors is merely a roundabout way of saying that the induction motor takes 60 kva of magnetizing power, while the synchronous motor gives out 20 kva, therefore the generator must give out the difference, or 40 kva.

Flow Conditions in a Transmission Line

A single flow of energy may have associated with it two or more separate flows of magnetization, as shown in Fig. 3. Here a synchronous condenser forms a local source of magnetization for the induction motors at the end of a transmission line, thus saving the losses of transforming and transmitting this flow, as well as performing other useful functions. The generator is shown

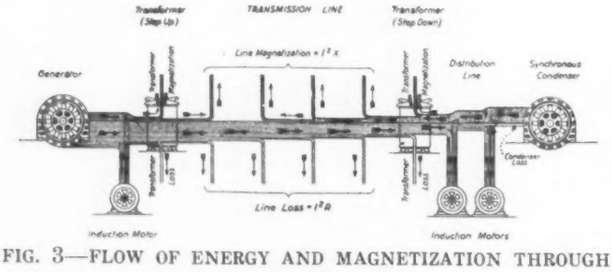


FIG. 3—FLOW OF ENERGY AND MAGNETIZATION THROUGH TRANSMISSION LINE

as furnishing the magnetizing power for motors in its vicinity. When the flow of magnetization is in the opposite direction to the flow of energy at full load, the voltage drop due to the load is decreased and the regulation is improved.

Charging power must flow to every part of a circuit where there is electrostatic capacity. With charging power, as with magnetizing power, the current and potential are in quadrature. In fact, charging power is the same as magnetizing power except that the direction of flow is reversed. The single term "magnetizing power" is then sufficient for both.

Office and Stock-Room Methods

At a recent meeting of the New England Section of the N. E. L. A. an interesting discussion on office and stock-room practices took place. With a short working day of eight hours, one company requires its storekeeper to bring the company's automobiles to the delivery door before the regular working hours in the morning and at noon, as well as to lay out the material, such as lamps and meters, for the drivers so that they may begin their outside duties at the earliest possible moment. It is also required that a slip be given to the order man for any replenishments of lamp stock required on the regular automobiles, for prompt replacement. All the company's property on the customer's premises is equipped with a metal label numbered serially and lettered, each piece of apparatus having a record card in the office giving its location. Regular stock boxes numbered according to the company vehicles facilitate the departure of wagons and trucks from the storeroom after these have been unloaded of supplies for which the driver should be given credit. The delivery of loads into the stock box enables reloading to be accomplished faster, credit being rendered each vehicle at the convenience of the stock clerks after its departure. In one large stockroom the clerks are provided with roller skates to save time in handling supplies to and from the windows.

One company installs prepayment meters in the service of delinquent customers, the meters being set for a rate of 25 cents per kw-hr. This assures prompt payment of monthly bills, and as the net rate is 15 cents, the company is able to credit the consumer with 10 cents of every quarter left in the meter and applied in this way to back bills. The Westinghouse company is now making a prepayment meter whose rate can be changed in thirty seconds. In the foregoing scheme the added first cost of the meter is in a way equalized in that all bills for the current month are promptly paid, with a slow but sure squaring up of all back bills without the ordinary expense of collections.

The Waterbury (Conn.) company sends out all bills on postal cards, without including meter readings. Eighteen thousand bills have been prepared on the addressograph in five days. Another company stated that many disconnection notices sent by telephone to the main office by customers have been withdrawn as a result of the simple expedient of asking the customer to put his request in writing.

To secure "pick-ups" promptly, the meter reader in Cambridge, Mass., leaves a return addressed post card, printed on the reverse side, so that it is only necessary for the customer to fill in a convenient time and date for the man to return for the reading. Every possible effort is made to secure keys for such places as churches and stables, the keys being numbered with a metal tag so that in the event of their being lost they cannot be used by the finder. In one office a card record is kept for each arc lamp on the system, showing life, outages, etc. This has saved the company six years' cost of keeping the record in a single claim against the manufacturer for reduced life.

The Buzzards Bay Electric Company makes photographic enlargements of United States Geodetic Survey maps in preparing exhibits of proposed rights-of-way for lines to be submitted to local authorities.

Experiments with a Plunger Electromagnet

A Simple Method of Determining the Pull on the Plunger When It Is in Motion—"Dynamic" and "Static" Pull Compared

BY B. C. BATCHELLER

IN this article is described a simple method for determining the pull on the plunger of an electromagnet when the plunger is in motion. This "dynamic" pull is then compared with the "static" pull (plunger held stationary) for the same air-gap and final value of the exciting current. The difference between the dynamic pull and the static pull is due to the effect of self-induction and the counter emf caused by the motion of the plunger. A method is also given for separating these two effects.

The static pull between coil and plunger was measured with a spring balance. A specially designed chronograph was used to record the movement of the plunger, and from the chronograph record the pull of the freely moving plunger was computed. The apparatus used is shown in Fig. 1. The coil *a* contains 7050 turns of No. 26 copper wire and is surrounded by an iron yoke *b*. An adjustable iron core *c* passes through a hole in the top of the yoke and enters the coil as far as desired, being held firmly in place by a set-screw in the yoke. The core is $\frac{5}{8}$ in. in diameter and $4\frac{1}{2}$ in. long. The plunger *d* is a solid iron cylinder $\frac{5}{8}$ in. in diameter and $4\frac{1}{2}$ in. long, having a square brass rod attached to its lower end. The upper end of the plunger is faced with copper about 0.01 in. thick, to prevent it from sticking to the core. In the experiments the thickness of this copper is not included in the air-gap. The plunger passes through a hole in the yoke, but is prevented from touching the yoke by a thin brass tube, about 1/64 in. thick, that forms a lining for the interior of the coil and guide for the plunger. The hole in the yoke through which the plunger slides is 11/16 in. in diameter. The length of the coil is $3\frac{1}{4}$ in., its outside diameter 2 15/16 in., and its inside diameter 1 5/16 in. The yoke is 2 in. wide and $\frac{3}{8}$ in. thick on each side of the coil. The plunger and its dependent brass rod weigh 0.57 lb. The total movement of the plunger was 1.019 in. This distance was divided into small intervals, the first 0.019 in. and the others 0.1 in.

The movement of the plunger when drawn up by the pull of the coil is recorded on the face of a rapidly revolving smoked disk *e* by a sharp-pointed steel stylus *f* attached to the plunger rod. The revolving disk is driven by an electric motor *g*. The record on the disk is a fine spiral line that can be accurately measured, and from the measurements the mean velocity of the plunger was determined over each 0.1 in. of its movement. From these velocities the pull was computed by the formula:

$$P = \frac{W}{2gl}(V_2^2 - V_1^2) + W, \qquad (1)$$

in which P = the pull in pounds, W = the weight of the plunger, g = gravity, V_1 and V_2 = successive velocities of the plunger, and l = the distance the plunger moved in changing from velocity V_1 to velocity V_2.

Since the pull P depends directly upon the difference of the squares of the velocities, the utmost pains had to be taken in measuring the length of the successive spaces and the time intervals in crossing those spaces. To secure the necessary accuracy the chronograph disk was revolved at a speed of about 1290 r.p.m. The point of the stylus was made sharp, in order that the record might be a fine line that could be measured with a high degree of precision. In measuring the spiral an effort was made to read the scale to thousandths of an inch. After repeated experiments and changes of method, quite satisfactory results were obtained, which could only be improved by more refined apparatus.

In Fig. 2 the curve *A* shows the static pull for any length of air-gap for a current of 0.670 amp in the coil. Curve *B* shows the pull between coil and plunger when the electric circuit was closed and the plunger allowed to move freely, starting from rest, the impressed emf, and therefore the final steady value of the current, being the same as for curve *A*. Curve *B* was plotted from the data obtained by means of the chronograph. Unlike curve *A*, it starts from zero at the beginning of the stroke.

As might be expected, the pull when the plunger moves freely is less than when it is fixed in position. Except at the beginning, where the air-gap is longest, the two curves, *A* and *B*, are somewhat similar in form.

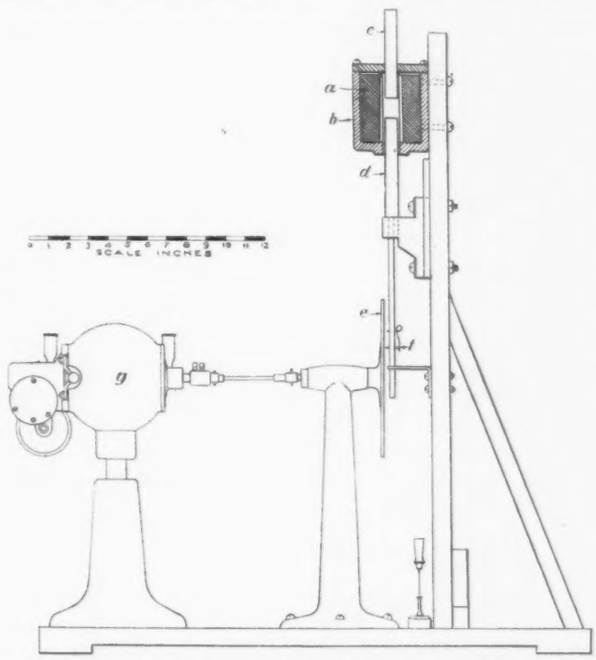


FIG. 1—APPARATUS USED IN EXPERIMENTS

The difference in the amount of pull in the two cases is due to two principal causes, namely, the self-induction of the coil and the counter emf caused by the rapid reduction of the reluctance of the magnetic circuit. Besides these two retarding effects, there are undoubtedly eddy currents in the brass tube that surrounds the core and plunger, which also retard the movement of the plunger. The effect of the eddy currents in the discussion below is included with that of the counter emf.

The self-induction that occurs when the circuit is closed prevents the current from reaching its maximum value during the stroke of the plunger. Assuming the coefficient of self-induction to remain constant, and disregarding the effect of the counter emf due to the movement of the plunger, the current strength at any given instant after the circuit is closed can be computed by the well-known formula:

$$i = i_0\left(1 - e^{\frac{-Rt}{L}}\right), \qquad (2)$$

in which i_o = the final current strength, R = the resistance of the circuit, L = the coefficient of self-induction, and t = the time interval from the closing of the circuit. In the present case $i_o = 0.670$ amp, $R = 161$ ohms, and $L = 1.85$ henries. The value of L changes as the plunger moves into the coil, but since in the present case the current reaches nearly its final value while the plunger moves over the first third of its stroke, and since the change in the value of L is small for this part of the stroke, the error in the use of formula (2) will not be large.

Using the values of i_o, R and L just given, the current strengths were computed for periods of time covered by the movement of the plunger, and are plotted as curve A in Fig. 3. This curve approaches the 0.670 amp line, which is an asymptote. In the same figure curve B

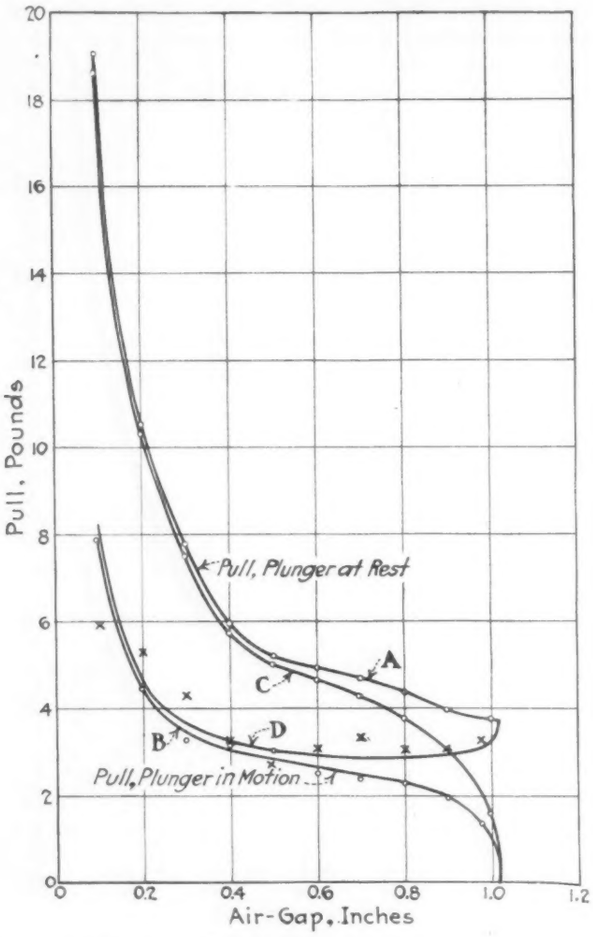


FIG. 2—RELATION BETWEEN AIR-GAP AND PULL

shows the position of the plunger at any instant, as determined by the chronograph record. A preliminary experiment showed that a steady current of 0.26 amp was necessary to produce a static pull equal to the weight of the plunger (see Fig. 4 on this page). In plotting curve B it is assumed that the plunger, when free, begins to move when the increasing current equals this amount. Curve A shows that 0.057 second had elapsed when the current reached this strength, and therefore curve B is assumed to begin at this point on the horizontal axis.

Neglecting the effect of the counter emf, the current in the coil when the plunger is in any position can then be read directly from Fig. 3. For example, when the plunger has moved 0.119 in. from the beginning of the stroke, corresponding to an elapsed time of 0.0224 second (curve B), the current in the coil is 0.575 amp (curve A). The pull on the plunger, were there no counter emf, would then be equal to the static pull corresponding to this current. Hence by first plotting a family of curves (Fig. 4) giving the measured static pull for various air-gaps and various exciting currents,

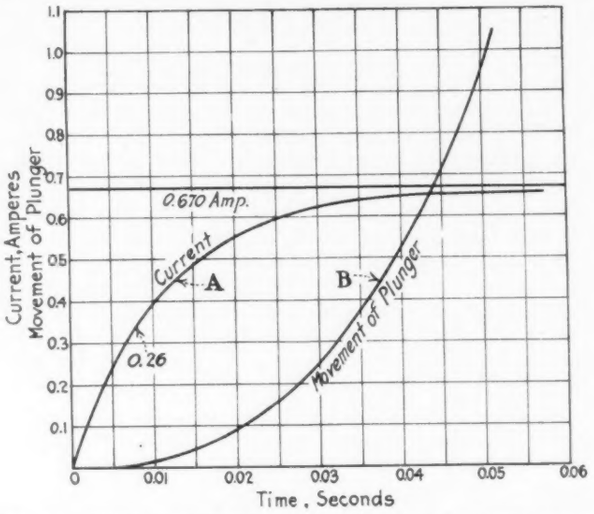


FIG. 3—CURRENT STRENGTH FOR VARIOUS PLUNGER MOVEMENTS

the dynamic pull, neglecting the counter emf, may be obtained directly from the measured static pull and the curves given in Fig. 3. The dynamic pull, as thus cal-

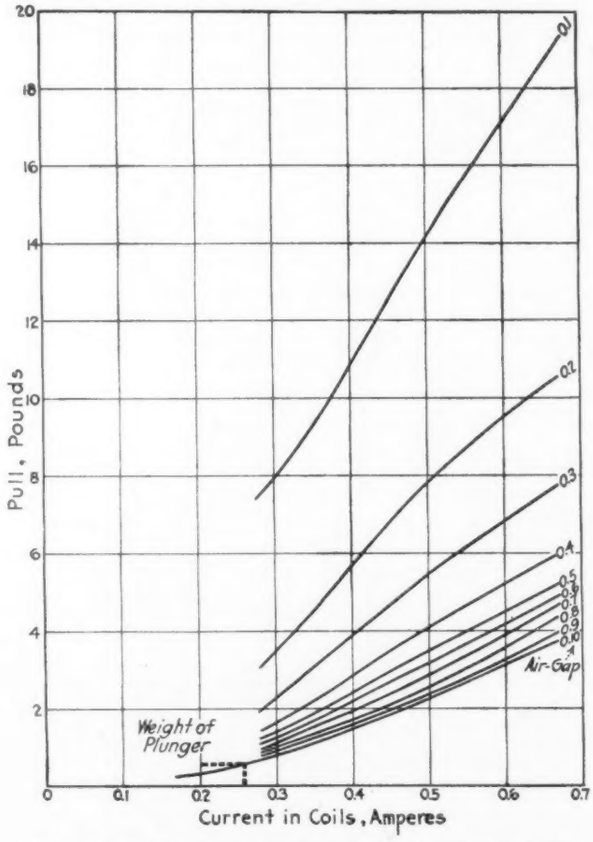


FIG. 4—STATIC PULL BETWEEN COIL AND PLUNGER

culated, is given by curve C in Fig. 2. This curve begins at zero with the maximum air-gap, and during the first third of the stroke rises nearly to the static curve A, which it follows closely for the rest of the stroke. The difference of the ordinates of curves A and

C represents the loss of pull caused by self-induction.

Since the freely moving plunger experiences loss of pull from only two causes of importance, viz., self-induction and counter emf, the difference of the ordinates of curves C and B must represent loss of pull due to the counter emf. If the difference of the ordinates of curves A and C be added to the ordinates of curve B, a fourth curve, D, will result, which shows the pull when counter emf is present but self-induction is absent. In other words, it is a curve of pull between the coil and freely moving plunger when the full current is on before the plunger is allowed to move. To test the accuracy of curve D, the plunger was locked, the circuit closed, and the plunger was then suddenly released and a chronograph record taken, showing the movement of the plunger. From this record the pull between coil and plunger was computed by equation (1). These pulls are plotted as crosses in Fig. 2. Seven of these points fall slightly above curve D, two below and one on the curve. On the whole, the correctness of curve D is well confirmed.

The amount of energy imparted to the plunger is the product of the mean pull and the stroke. Fig. 2 shows that the mean pull when the plunger moves freely is only about half what it is when it moves very slowly. This shows one of the limitations of this device when applied as a hammer. Another limitation is the time required to demagnetize the coil.

Considerations on the Sensitiveness of the Heterodyne Receiver in Wireless Telegraphy

BY MARIUS LATOUR

The following comprises a theoretical study of the sensitiveness of the heterodyne system using "crystal" rectifying detectors.

It is usually assumed that the current rectified by crystal detectors is proportional to the square of the alternating electromotive force which acts in the circuit of the detector. If this voltage is designated by v, the current in the receiving instrument (telephone or galvanometer) is $i = kv^2$.

Let it be imagined that into the receiving circuit an emf V of the same periodicity as v, but displaced in phase by the angle φ, is introduced. The resultant emf while receiving will be

$$V_t = \sqrt{V^2 + v^2 + 2Vv\cos\varphi}$$

When not receiving, the rectified current is kV^2; while receiving, $k(V^2 + v^2 + 2Vv\cos\varphi)$. Hence the change in the value of the rectified current due to receiving is $i' = k(v^2 + 2Vv\cos\varphi)$. This is the change in current which acts on the receiving apparatus and measures, so to speak, the intensity with which signals are received.

It is, therefore, possible to consider the ratio $\eta = i'/i$ as the ratio of the sensibilities with and without the auxiliary periodic emf V.

In this connection it is of no importance that i' and i may occasionally be of opposite sign; the receiving apparatus operates no matter what the direction of i' or i. One has accordingly only to consider the absolute values of these quantities.

From the above one derives

$$\eta = \frac{i'}{i} = 1 + 2\frac{V}{v}\cos\varphi.$$

Let a few special cases be considered:

$\varphi = 0$. The two emfs are in phase. For this special case

$$\eta = 1 + \frac{2V}{v}.$$

$\varphi = \pi$. The two emfs are in opposition. For this special case

$$\eta = 2\frac{V}{v} - 1.$$

$\varphi = \text{arc cos}\ (-v/2V)$. The resultant emf is equal to the component emf V. For this particular case $\eta = 0$. There are, therefore, cases where the introduction of an auxiliary emf diminishes the response and, in fact, makes receiving impossible whenever the values are in the neighborhood of arc cos $(-v/2V)$.

Let it now be imagined that the voltage V is not of quite the same periodicity as the voltage v, this case corresponding to the conception underlying the heterodyne system.

One can assume in this case that φ takes all the successive values between 0 and 2π and introduce the conception of η_m as an average η. Considering only the absolute values of η, one finds

$$\eta_m = \frac{1}{\pi}\left[\int_0^{\text{arc cos}\,(-v/2V)}\left(1 + 2\frac{V}{v}\cos\varphi\right)d\varphi - \int_{\text{arc cos}\,(-v/2V)}^{\pi}\left(1 + 2\frac{V}{v}\cos\varphi\right)\right]$$

$$= \frac{\left[2\,\text{arc cos}\left(-\frac{v}{2V}\right) - \pi\right] + 4\frac{V}{v}\sqrt{1 - \frac{v^2}{4V^2}}}{\pi}.$$

In the case where $2V$ is very large as compared to v, η_m reduces itself to

$$\eta_m = \frac{4}{\pi}\frac{V}{v}.$$

In the above there has been considered, so to speak, the average current rectified between 0 and 2π. One might, however, have approached the problem in a simpler and more direct, although less exact, way.

The two extreme values between which the rectified current varies in the case of voltages v and V of nearly the same periodicity are $k(V + v)^2$ and $k(V - v)^2$. The difference between these two values is $4kVv$. If one considers this last value as a measure of sensitiveness of receiving, one finds for η the value

$$\eta = 4\frac{V}{v}.$$

It is, however, more probable that the average value is the better measure.

Stopping Air Leaks in Boiler Settings

Sometimes one-third to one-half the air passing through the breeching enters the furnace through leaks in the settings. Usually these leaks occur through cracks in the setting or where the masonry joins the metal parts of the boiler. The Bureau of Mines suggests that the best materials for stopping leaks are asbestos rope or packing and asbestos cement. The rope should be pushed tightly into the cracks with a screwdriver or some blunt-edged tool. If asbestos cement is used, it should be made into a thick paste by mixing with very little water and should then be pushed into the cracks or openings like the rope. As it shrinks after drying, it should be tamped in still further. Lime or cement mortar should never be used as it lacks elasticity and falls out after drying.

Horizontal water-tube boilers of the cross-flow type frequently develop air leaks in the setting around the soot-blowing holes in the side wall. Sometimes the baffles burn out, allowing the gases to pass directly from the grate to the breeching instead of across the tubes. When this condition exists the flames are plainly visible through the cleaning holes in the second pass. High temperatures in the chimney indicate dirty flues as well as broken baffles.

Electric Lighting for Motion-Picture Studios

Kind and Arrangement of Lamps Suited for Attaining the Best Results with High-Speed Photography

BY L. G. HARKNESS SMITH

THE use of artificial light for photographic purposes has received constantly increasing attention during the past few years, mainly because of progress in the motion-picture industry. In the earlier days of the business all pictures were made in direct sunlight and usually under ideal photographic conditions, but as the pressure of increasing demand for

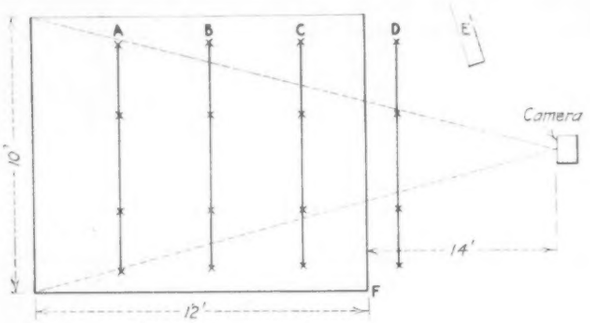


FIG. 1—LIGHTING OF 12-FT. BY 10-FT. STAGE

film and the uncertainty of weather conditions became more apparent to the producers they found it necessary to experiment with electric lamps which would approximate as closely as possible the effects to be secured with natural daylight.

One fact was evident from the beginning: To secure sufficient light for making motion pictures would require larger and more powerful equipment than had previously been employed for "still" photographic purposes, as well as studios of a different type from the average "still" picture studio. When photographing objects in motion each unit of the film can be exposed only about 0.02 second, whereas in stationary objects the time of exposure for interiors may be from three seconds to several minutes for each subject, according to conditions. The first attempts at securing satisfactory results were bad indeed, but fortunately of such a nature as to encourage further study. Gradually the best conditions for placing lamps and the information regarding the type of such lamps became known, so that to-day entire films are made under artificial light with excellent results in the finished picture.

In making any photograph the first principle to be observed is that in nature the source of all light is the sun. Therefore, where the picture is made "in the open" there will be a strong light from one direction, accompanied by deep and well-defined shadows. This is elementary and must always be observed where it is desired to reproduce exterior conditions under artificial light. On the other hand, when pictures are made "indoors" under natural conditions (in other words, in daylight) it will be found that there are both direct and reflected light, the former from the sunlight outdoors, entering through doors, windows or skylights, the latter from the reflection of this light on surfaces within the room.

Where "interior" pictures are to be made to imitate lamplight, candlelight or firelight, still another condition prevails—the presence of one source of direct light, with only a very small amount of reflection from surrounding objects or from wall surfaces. It must be borne in mind in photographing very rapid motion that unless the entire principal objects in motion be illuminated very intensely only a portion of the picture will come out in developing. For example, if the figure of a man be placed in the concentrated light from arc lamps and only a small amount of light be played on the background, the result will be a sharply defined figure against a background of black. On the other hand, if the entire stage including the figure be equally illuminated, the result will be a picture in which there is little contrast and practically no sense of depth.

It may be laid down as a safe rule in studio practice that there shall be, first, a primary source of light, which may be obtained in different ways described later, and in addition a secondary source, used to accentuate portions of the scene or action which it is desired to bring out in sharp relief. Unfortunately, a large number of studio directors and camera men, through a lack of adequate knowledge of the character of the lamps at their disposal, have apparently contented themselves with the primary light alone, which accounts for the very unsatisfactory films so often shown on screens.

Primary light may be obtained from a number of styles of lamps, among which the more commonly used are the open-arc, the multiple-arc, the inclosed-arc, and the mercury-vapor lamps. The usual and most satisfactory method of arranging lamps is to place them above the scene and sufficiently far forward to project the light backward and downward at an angle of 45 deg. upon the scene or the object which it is desired to photograph. After lamps have been hung properly, it may be found that they cast deep shadows which are inconsistent with presumed natural conditions, in which case movable screens of some opaque white substance must be so placed as to distribute the light by reflection and faintly illuminate the shadow side. If it is still

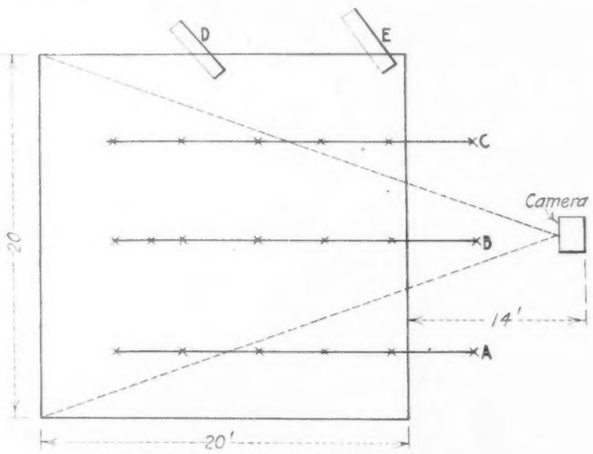


FIG. 2—LIGHTING OF STAGE 20 FT. SQUARE

found that the persisting contrast is too strong, the light must be further modified by interposing diffusing screens of white cheesecloth or similar translucent material. In practice screens are usually placed about 18 in. from the light source, and, as their name indicates, they serve to diffuse and modify the direct light, thereby softening the resulting photograph. With these two

methods of light distribution and diffusion it will be found that the faces of figures in the finished picture are in perfect "modeling," permitting ready interpretation of every expression.

While this rule for light distribution applies either in daylight or under electric light, fortunately the advantage is on the side of the artificial conditions, for the reason that the actinicity of artificial lights is unchanging, while that of sunlight varies according to weather, season or time of day. It will be seen, therefore, that with a "set" of definite size, lamps of known characteristics, and a color scheme of predetermined value, there is only a small chance of variation in the quality of the pictures obtained.

In home portraiture taken in daylight, for example, the operator must select a point in the interior at which to place his subject so that he can control the illumination. If the room be poorly illuminated, he is forced to experiment with reflecting screens until he has determined the "light value," while under artificial light it does not matter where the picture may be taken, as he is fully informed in advance of the light-giving power of his lamps and may safely anticipate good results under all conditions.

In motion-picture work the placing of the lamps must be adapted to the general character of the settings, and since "flat" lighting or lighting which shows no direction of light in the finished picture is admittedly inartistic, there must be concentrated light in addition to that from the overhead source. Fig. 1 shows a relatively small stage, which is 12 ft. deep from the "front line" to the background. The illumination is secured by using sixteen inclosed-arc lamps (*A*, *B*, *C*, *D*) placed 12 ft. above the floor, arranged in rows of four, and projecting their light downward and backward at an angle of 45 deg. In this instance no diffusing screen has been used, as it was found that after a short time carbon from the lamp electrodes deposited a semi-transparent film on the inner surface of the inclosing glass, which then served to diffuse the light sufficiently to eliminate excessive glare. In addition to the overhead lighting equipment there is one twin-arc lamp (*E*) placed at the side and about 5 ft. in front of the "front line" of the scene (*F*). The lamp is provided with a

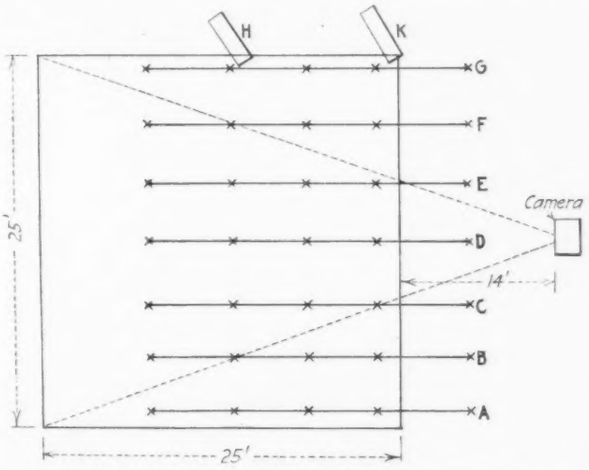


FIG. 3—LIGHTING OF STAGE 25 FT. SQUARE

diffusing screen of semi-opaque white cloth. The light from the lamp *E* is directed upon the faces of the actors, who work close to the front line in all of the principal actions of the scene. The power required to operate this equipment is 2200 watts for each of the upper lamps and 1650 watts for the twin-arc lamp, or a total demand of about 37 kw.

Fig. 2 represents a somewhat larger stage, measuring 20 ft. by 20 ft. The lamps are arranged in three banks or rows, 12 ft. above the scene. There are six lamps in the first row (*A*), seven in the second row (*B*), and six in the third row (*C*). Inclosed-arc lamps of the same type as in Fig. 1 are employed. No diffusing screen is used on the overhead lamps.

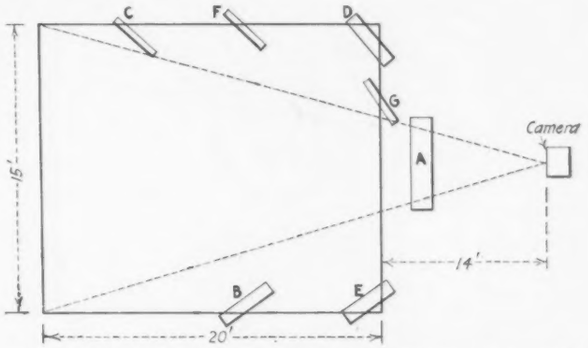


FIG. 4—ARRANGEMENT OF MERCURY-VAPOR AND QUADRUPLE-ARC LAMPS

For side lighting there are two multiple (quadruple) arc lamps (*D* and *E*), each provided with a corrugated-glass diffusing screen. The power required is 2200 watts for each of the top lamps and 11,000 watts for both side lamps, making a total demand of about 53 kw.

Fig. 3 is a still larger stage, 25 ft. by 25 ft. This is illuminated by seven rows of overhead lamps (*A*, *B*, *C*, *D*, *E*, *F*, *G*) of the same type as in the two preceding instances. They are arranged lengthwise of the stage and are supplemented by two twin-arc lamps (*H* and *K*). Both of the twin-arc lamps are provided with cloth diffusing screens. For the thirty-five overhead units 77,000 watts is required, while 3300 watts is needed for the twin arcs, making a total demand of about 80 kw.

Fig. 4 shows a combination of mercury-vapor and quadruple-arc lamps. In this instance, in addition to the overhead bank of mercury-vapor lamps, there are four side banks. The overhead equipment (*A*) consists of ten white-backed mercury-vapor tubes, suspended at a height of about 10 ft. and throwing light on the stage at an angle of 45 deg. Each of the side banks *B*, *C*, *D* has eight vertical white-backed tubes. The side bank *E* has eight horizontally arranged tubes backed alternately with white and red reflectors. The quadruple arcs (*F* and *G*) were provided with white-cloth diffusing screens. With this equipment, which was used at a test conducted before the New York Electrical Society, it is likely that excess light was provided and that equally good results might have been obtained with far less light. The film resulting from this test is shown in Fig. 5. The power required was 16,170 watts for the mercury-vapor tubes and 14,520 watts for the arcs, making a total of about 31 kw.

Fig. 6 shows the arrangement for a "firelight" scene, taken entirely with twin-arc portable lamps. The lamp *A* is placed back of the opening in the fireplace *E* and throws a direct undiffused light on the face of the actor *D*, who sits in a chair in front of the fire. *C* is a bank of four portable twin-arc lamps, arranged with cloth diffusing screens, and *B* is another twin-arc lamp, also equipped with a diffuser. The demand in this case is very small, being 9900 watts. The result of this arrangement will be to throw the face of the actor into strong relief, leaving the rest of the scene in comparative darkness.

Where opening a door is intended to admit outside illumination a light should be so arranged as to illuminate the area outside the door.

Nothing has been said so far about the use of reflecting screens above overhead lamps. They are seldom employed in actual practice, probably because camera men have not cared to take the trouble to arrange them, but it will be found that when they are installed good results can be obtained with a much lower power demand. A white reflecting screen will tend to confine the

FIG. 5—FILM RESULTING FROM TEST OF SYSTEM INDICATED IN FIG. 4

light within the desired area, and the effect is uniformly good.

A very important phase of motion-picture photography is the use of artificial light outside the studio when conditions make it impossible to secure direct daylight. Pictures have been made successfully at the sea bottom, in mines, in factories, and even in the New York subway. For this purpose the best form of lamp is the portable multiple arc. For the subway pictures the Vitagraph Company used twelve twin-arc lamps. Two sets of six in series were connected across the 600-volt feeder circuit. The lamps were arranged in pairs on four posts 10 ft. apart, making a total depth of about 50 ft., and the camera was placed about 12 ft. above the

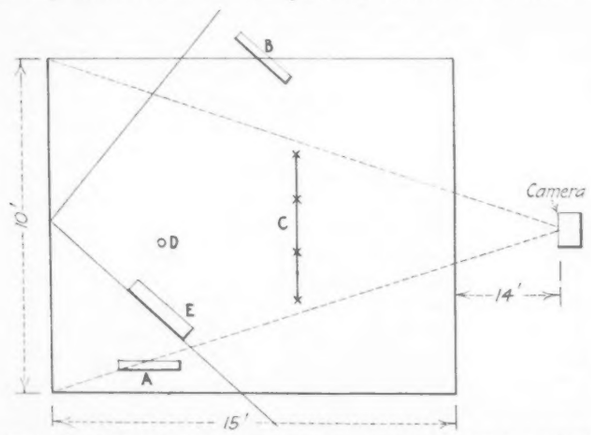


FIG. 6—ARRANGEMENT OF TWIN-ARC PORTABLE LAMPS

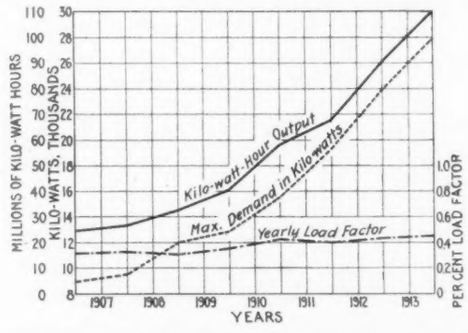
subway platform, flanked on either side by two lamps placed about 4 ft. apart and perhaps 3 ft. in front of the lens on a horizontal plane. The resulting pictures were perfect photographically and showed the traffic during the rush hours. These pictures were made for the city of New York and are to form a part of its exhibit at the Panama-Pacific Exposition.

Mining pictures have been made on several occasions, the latest at Butte, Mont., showing the operation of a copper mine several hundred feet underground. The under-sea pictures were made by employing an adaptation of the diving bell, in which the camera operator was stationed, and by inclosing quartz-tube lamps in waterproof reflectors which were lowered into position outside the bell. The intensity of illumination which was obtained was sufficient to permit photographing objects 20 ft. from the camera. Diving natives, fish and a submerged wreck were shown.

No mention has been made of the incandescent lamp for photographic purposes, for the reason that at this time it is seldom used in motion-picture work. Tests have been made with this type of lamp, but as its light is decidedly deficient in actinicity it has been found more satisfactory to continue the use of the types already mentioned. For "still" photographs, where arc lighting cannot be conveniently employed, the 1000-watt gas-filled lamp has proved to be a boon. It enables any studio to disregard weather conditions, and although care must be used in the placing of the subject, in order to obtain a proper illumination, yet it does enable the photographer to turn out good pictures without worrying about sunshine. Two 2000-watt lamps with color correctors are ample in ordinary work. The consensus of opinion in the trade seems to be that the best light for "still" photography is that of the arc, with the light of mercury-vapor lamps second and incandescent lamps in third order of choice. For motion-picture work there is a wide variety of opinion. Those who have used mercury-vapor lamps exclusively seem to get fair results, as do also film manufacturers who cling to arc lamps alone, but it is probable that a combination of the two is best, mercury-vapor tubes being used for "side-bank" lighting, arc lamps for "overhead-bank" lighting, and portable twin-arc sets for outside use and to bring out detail in the studio.

Growth of Output of Minneapolis System

The accompanying curves show the rapid rate of growth which has been enjoyed by the Minneapolis General Electric Company since 1907. The recent general depression in business has been less severely felt in the Twin City district than perhaps any other section of the country, and as a result the rate of increase of the local central-station company has been little affected despite the conditions of the last few months. Besides



OUTPUT, DEMAND AND LOAD-FACTOR CURVES

the rapid growth of the output and connected load of the company's system, the load-factor has displayed a marked upward trend, reaching 42.5 per cent for 1914. The total output for the year was 110,000,000 kw-hr. and the maximum demand 28,000 kw. Mr. R. F. Pack is vice-president and general manager of the Minneapolis company.

DIGEST OF ELECTRICAL LITERATURE

Generators, Motors and Transformers

Single-Phase Series Motor.—ROBERT MOSER.—A mathematical article on the theory of the single-phase series motor in which the author derives the circular-current diagram in a simple way from the ampere-turn diagram and develops several other diagrams.—*Elek. u. Masch.* (Vienna), Feb. 28 and March 7, 1915.

Phase Advancers.—An editorial expressing the opinion that the problem of installing phase advancers is mainly a financial one. Unless rates are so adjusted that a distinct financial advantage accrues to the user after every factor has been properly weighed, it is absurd to suppose that phase advancers will appeal to him; indeed, the tendency will be just the reverse, and the intelligent user will certainly sacrifice power-factor for efficiency when buying his motors. With regard to the power-factor of the system, the user argues that its rectification logically belongs to the supply company.—London *Electrician*, March 12, 1915.

Non-symmetric Loads on Transformers.—M. VIDMAR. An investigation of the results of non-symmetric loads on transformers supplying energy to three-wire single-phase systems or three-phase systems, if the lamps are placed on one-half or on one phase of the system. The distribution of the loads and the voltage drops are calculated for different transformer connections—delta-star, star-zigzag, etc. Considerable attention is paid to the stray fluxes, which are of great importance for this problem. The investigation is carried out for both three-phase and single-phase transformers and the analogies and differences between the two cases are pointed out.—*Elek. u. Masch.* (Vienna), Feb. 7, 14, and 21, 1915.

Lamps and Lighting

Tungsten Lamps.—PAUL EYDAM.—An article discussing "some defects in tungsten lamps" and comparing squirted-tungsten filaments with drawn-tungsten filaments. During the manufacturing stage there are more breakages with squirted than with drawn filaments, but after burning for 600 or 800 hours the squirted filament is the more flexible and has less tendency to a crystalline structure. This crystallization tends to magnify the size of the separate particles, exactly as in the case of all metals exposed to high temperatures. The mechanical treatment of the filament tends to decrease the size of the larger crystals formed during the sintering process, but during the heating of the filament in the lamp this tendency is reversed. Notes are given on the methods used for soldering the filaments to the leading-in wires, on the composition and size of the wires used for hooks, on the production of the vacuum, and on methods of testing the lamps.—London *Electrician*, March 26, 1915.

Compulsory License Refused.—Judgment has been given in London against the Robin Electric Lamp Company, Ltd., on its application for a compulsory license under certain patents relating to drawn-tungsten wire held by the British Thomson-Houston Company and the Siemens Brothers Dynamo Works, Ltd. The court held that the patentees had fully met the needs of the public and that no new industry has been prejudiced by the conditions which they sought to impose upon the Robin company.—London *Elec. Eng'ing*, March 18, 1915.

Unit of Candle-Power in White Light.—C. C. PATERSON AND B. P. DUDDING.—A brief note of a (British) Physical Society paper in which the authors describe the methods adopted at the (British) National Physical Laboratory for minimizing the difficulty of photometric comparison of white lights of different hue. A series of six sets of electric sub-standards are described varying in the tint of the light radiated from that of the pentane lamp to that of a tungsten vacuum lamp operating at 1.5 watts per candle. The absolute value of the unit of candle-power has been re-determined, as have also the corrections for humidity and barometric changes, while the probable existence of a temperature correction is discussed. An account of the discussion which followed is also given.—London *Electrician*, March 26, 1915.

Leading-In Wires.—A note on a recent British patent (No. 4235, 1914) of the British Thomson-Houston Company and the General Electric Company of this country for a method of covering wires with a coating of a borate to facilitate sealing into glass and the use of copper-plated iron-nickel wires so coated.—London *Elec. Eng'ing*, March 18, 1915.

Generation, Transmission and Distribution

Electric Winding.—A profusely illustrated description of an 8-ton electric winding gear for the East Rand proprietary mines. The length of wind is 4500 ft., the weight of the skip 8500 lb., and the weight of ore per lift 16,000 lb. The maximum total suspended load, including the rope, is 56,000 lb. The winding speed is 2300 ft. per minute. The gear is operated on the Ward-Leonard system. There are two main motors, each of 750 brake-hp. These are supplied with direct-current energy from a motor-generator set, consisting of two generators and an exciter driven by a slip-ring induction motor rated at from 1800 to 5000 brake-hp. The supply current which drives this motor is three-phase at 3000 volts and twenty-five cycles. The whole of the control of the main motors is carried out by varying the excitation of the two generators.—London *Eng'ing*, March 19, 1915.

Wires, Wiring and Conduits

Wiring Rules.—R. BERON.—A summary of the wire rules in force in Austria and a comparison with the German regulations.—*Elek. u. Masch.* (Vienna), Feb. 14, 1915.

Electrophysics and Magnetism

Spontaneous Ionization of Air in a Closed Vessel.—LEOPOLD J. LASSALLE.—An account of an experimental investigation of the diurnal variation of the earth's penetrating radiation at Manila, Philippine Islands. The value of N, the number of ions per cubic centimeter per second formed in a closed vessel in Manila, has a maximum of 8.96 at 4 p. m. and a minimum of 4.94 at 10 a. m. The mean for N is found to be 7.43. It seems probable that the main causes of the ionization are the radioactive materials in the soil and the radioactive matter in the atmosphere. Since there is no reason to suppose that the former of these two causes might have a diurnal variation, it must be that this variation is in the latter cause. The air currents at Manila have a diurnal variation, sea breezes blowing at times and land breezes at other times. While the exact nature of the relationship cannot be established from the data available, it seems probable that the minimum must occur at a time when the air over the land has been blown from over the sea, where it had previously remained long enough to lose a considerable portion of its activity by decay. The maximum, which is fairly steady from 3 p. m. to 6 a. m., must be due to the air which is over land during this period having previously been mainly over land for some considerable time.—*Physical Review*, February, 1915.

Ionization by Impact.—BERGEN DAVIS.—While former methods of determining the ionization voltage were indirect, a direct method has recently been devised by Franck and Hertz, who have also added an interesting idea to the conceptions of ionization by impact, namely, that in certain gases the impacts are nearly or quite elastic. In general the noble gases (neon, helium) exhibit the phenomenon of elastic impact, while, on the other hand, the gases that form chemical compounds readily (hydrogen, nitrogen, oxygen) behave as though the impacts were non-elastic. The same experimenters have investigated the ionization voltages for nitrogen and oxygen with a specially designed apparatus which gives no current until the ionization voltage is reached. The current then increases rapidly with an increase of the applied voltage. In the present paper the author develops a theory of the current curves for this apparatus in the case of non-elastic impact and compares it with the experimental results. As far as the experiments go, there is good agreement. This supports the assumptions made in the paper and indicates that the impacts in nitrogen and oxygen are nearly or quite non-elastic. The same issue contains a note, by H. W. Farwell, giving an addition to Davis' theory.—*Physical Review*, February, 1915.

The Potential in a Dielectric Sphere in a Uniform Field of Force.—GEORGE R. DEAN.—The solution of this problem as given in the textbooks on electrical theory requires so much preliminary work in the general theory of spherical harmonics that the student is likely to become discouraged. The solution given in the present article is more direct and simple than the general process.—London *Electrician*, Feb. 19, 1915.

Magnetic Properties of Steels and Their Chemical Composition.—W. E. RUDER.—An article illustrated by numerous diagrams in which the author discusses the effects upon the magnetic properties of iron due to the addition of silicon, aluminum, arsenic, tin, copper, cobalt, nickel, chromium, tungsten, molybdenum, sulphur, phosphorus and oxygen. He also discusses the non-ferrous alloys and makes reference to several prominent theories purporting to explain the phenomenon of magnetism.—*Gen. Elec. Review*, March, 1915.

Atoms and Ions.—J. J. THOMSON.—An account of the first three of a series of six lectures on recent research on atoms and ions in gases.—London *Electrician*, March 12, 1915.

Oscillations.—FRACQUE.—A new chapter of his lectures on the mathematical theory of wireless telegraphy. In the present instalment the author deals with the phenomena which occur in a circuit when its terminals are suddenly connected to the two poles of a source of emf. —*La Lumière Elec.*, Feb. 13, 1915.

Damping Factors.—A. PRESS.—A brief mathematical paper on harmonic damping factors for alternating-current fields.—London *Electrician*, March 19, 1915.

Secondary Effects from Roentgen Rays.—PAUL T. WEEKS.—An explanation is given for a peculiar effect from secondary Roentgen radiation, originally noted by F. R. Gorton. The relative intensifying effect from different metals placed behind a plate when exposed to Roentgen rays of various penetrations is investigated. Additional evidence is given of the need for preventing or screening off the general scattered radiation.—*Phys. Review*, March, 1915.

Units, Measurements and Instruments

Determining the Direction of Rotation of a Rotary Field.—A. KLEINSTÜCK.—An illustrated translation in abstract of his German article, noticed some time ago in the Digest, on the use of a wattmeter for determining the direction of rotation of a polyphase field.—London *Electrician*, March 19, 1915.

Switchboard Instruments.—G. QUAINK.—An illustrated article on various forms of switchboard instruments. The author first describes the round-face type and shows how the consideration of saving space in switchboard instruments has led to the development of the edgewise instruments. These were first built with a cylindrical dial covered by a cylindrical glass as shown in section in Fig. 1. The end point of the

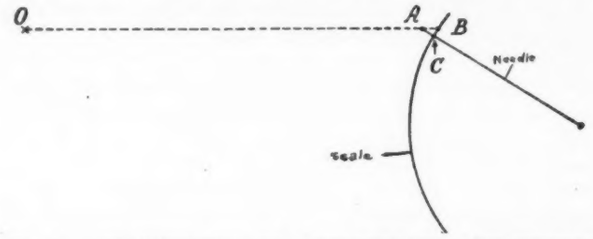


FIG. 1—ARRANGEMENT OF SWITCHBOARD INSTRUMENTS

needle is turned around and the point about which the needle rotates is the center point of the cylinder forming the scale. This instrument has the great disadvantage that it is liable to considerable error of readings. For instance, an observer at point *O* observing the point *A* of the needle sees point *B* of the scale, while the reading should really be point *C* of the scale. The greater the curvature of the scale and the greater the angle *BAC*, the greater is the error of the reading. The Siemens & Halske company has recently introduced edgewise instruments with a straight perpendicular face instead of the cylindrical face so that the error just pointed out is avoided. Of course, a plane perpendicular scale without any curvature is impossible if the needle is rigidly fixed to the revolving axle of the instrument. The arrangement is as shown in Fig. 2 in two vertical sections perpendicular to each other. *a* is the revolving axle of the measuring instrument and the arm *f* is rigidly connected to this axle. The end point *e* of the arm *f* is rigidly connected to some point of the needle *d* of the instrument. The one end point *k* of the needle *d* is forced to travel along a straight vertical line as indicated in the picture. If the dimensions of the different arms are correctly chosen, the other end point *i* of the needle *d* will travel along a straight line *mm*. This is made the scale. The friction is said to be practically negligible. It is, of course, not necessary to construct the instrument with a vertical scale since the

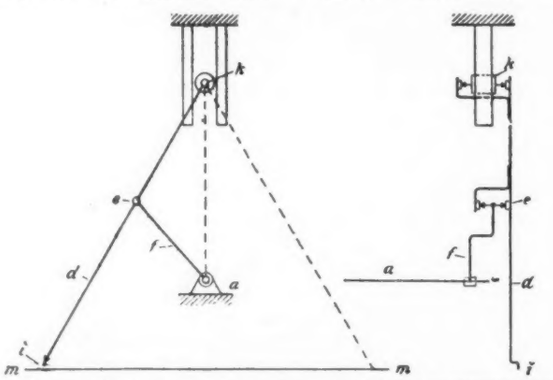
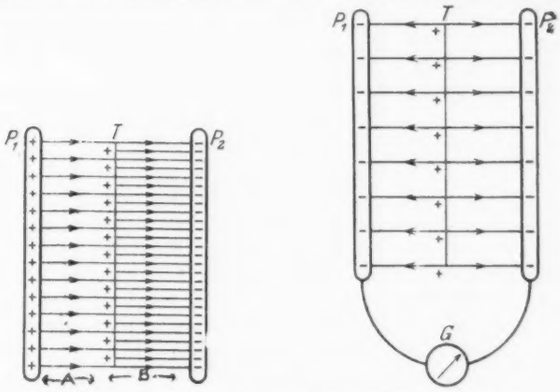


FIG. 2—ARRANGEMENT OF SWITCHBOARD INSTRUMENTS

scale may also be arranged in an inclined plane.—*Mitt. Siemens & Halske*, July, 1914.

Dielectric Properties of Different Insulating Materials.—KARL WILLY WAGNER.—The first part of an article in which the author gives a summary of extended measurements of the dielectric properties of different commercial insulating materials. The author first gives a sketch of the theory of "dielectric hys-

teresis," which he prefers to call dielectric after-effect ("nachwirkung") instead of dielectric hysteresis. He first shows to what cause dielectric hysteresis loss is due. In Fig. 3 is shown a plate condenser consisting of two plates P_1 and P_2. The intermediate dielectric is assumed to consist of two layers of different insulating materials in series of the thicknesses a and b respectively. The two insulating layers are in contact with each other at the plane T. The author shows theoretically that if this condenser is charged by means of a constant emf there will be in general a gradual accumulation of free static electricity at the boundary surface T of the two dielectrics. This will always take place if the ratio of the two conductivities of the two dielectrics differs from the ratio of their dielectric constants. If, for instance, the ratio of the conductivity of the left-hand dielectric to the conductivity of the right-hand dielectric is greater than the ratio of the corresponding dielectric constants, after a certain time there will be an accumulation of positive charges at the boundary surface T if P_1 is charged positively and P_2 is charged negatively, as indicated in Fig. 3. This is the fundamental phenomenon of dielectric hysteresis. While these considerations are based on two different dielectrics in series, they may be extended to any dielectric which is not homogeneous. It is, therefore, the lack of



FIGS. 3 AND 4—PLATE-CONDENSER DIAGRAMS

homogeneity of an insulating material which causes the dielectric hysteresis. The lines with arrows between the two plates in Fig. 3 represent lines of dielectric displacement. Fig. 3 represents the stationary conditions after the condenser has been charged. If now the condenser is discharged—for instance, by connecting the two plates P_1 and P_2 through the galvanometer G as shown in Fig. 4—the positive charges which had accumulated at the boundary surface T have no time to disappear at once, and shortly after the discharge the condition of the condenser will be as indicated in Fig. 4. As there are still positive charges on the boundary surface T, the two plates P_1 and P_2 will be negatively charged, and as the equalization of charges in the two parts TP_1 and TP_2 of the condenser occurs with different velocities, there will be observed in the galvanometer G a small discharge current for a long time after the condenser has been discharged. If now the discharge circuit is broken before the positive charges on the boundary surface T have completely disappeared, the two plates P_1 and P_2 will gradually assume charges against each other. This is the reason for what has been called the residual charge of a condenser. All these considerations relate to the charge of a condenser at constant pressure. If it is charged with varying pressure, the phenomena may be considered as a series of charges, each for an infinitesimal time at constant pressure. If the analytical calculation is carried out for the case of a sinusoidal alternating emf, the charging current will lead the emf not exactly by 90 deg. but only by $90 - \delta$ deg. The energy loss in the dielectric is $N = 2\pi nCV^2$ tangent δ where δ is the "dielectric loss angle," n the frequency, C the capacity of the condenser and V the effective emf. The power-factor of the condenser is sin δ, which is in most cases practically identical with tangent δ, as δ is a small angle. The angle δ is a characteristic constant of the insulating material, and one of the chief objects of the author's investigation was the determination of this constant for numerous insulating materials. The article is to be continued.—*Elek. Zeit.*, March 11, 1915.

New Method of Obtaining a Hysteresis Loop.—W. N. FENNINGER.—A brief abstract of an American Physical Society paper. For students beginning the study of motors there had been designed an electromagnet to show that the force on a conductor placed in a magnetic field is given by the well-known expression $F = I'H'L'/10$, when the proper units are used. The pole faces of the magnet were accordingly made long and narrow (about 15 cm by 4 cm). Between the poles was placed a wire, each end of which dipped into a mercury cup. This wire was suspended by two dial spring balances which could be raised or lowered easily so as to keep the wire always at the same height. It occurred to the author that this apparatus could be used to obtain a hysteresis loop. Since N, the number of turns on the coils of the electromagnet, and L, the length of coils, were known, the magnetizing force was computed from the usual expression $H = 4\pi NI/10L$. From the expression given above for the force on a conductor the intensity of the field is found to be $H' = 10F/I'L'$. A current of 100 amp in the conductor gave a maximum pull of a little more than 20 ounces on each balance. Tenths of an ounce were read on the balances. The current in the field was varied by small steps so as to have the iron pass through the hysteresis cycle, and a hysteresis loop was plotted from the results. The points fell on a smooth, closed curve, excepting two which deviated less than 1 per cent. The points in favor of this method are that there is no need of demagnetization to obtain the loop, that each determination of the flux is independent of every other determination, and that the deflections to be read are steady ones and not momentary throws. One special advantage is the facility with which the closing of the loop may be checked. Aside from the simplicity of mechanical manipulation, the method has certain pedagogical advantages.—*Phys. Review*, March, 1915.

Telegraphy, Telephony and Signals

Mercury-Vapor Tube Oscillator.—B. LIEBOWITZ.—A brief abstract of an American Physical Society paper. A method for obtaining electrical oscillations of frequencies suitable for radiotelegraphy is described. A mercury-vapor tube is provided with two mercury cathodes and an iron or graphite anode. Each cathode is connected through a large inductance and resistance to the negative terminal of a high-voltage direct-current generator, and the anode, likewise through an inductance, to the positive terminal. An oscillatory circuit is connected between the cathodes. By this means oscillatory currents as large as 10 amp (root-mean-square value) at frequencies of the order of 500,000 have been obtained, but these oscillations were not steady. Very steady oscillations have been obtained at frequencies of about 35,000. This method seems to be specially adapted for high powers. The experiments are being continued. It is pointed out that in all oscillators supplied with energy from a constant potential source at least 50 per cent of the energy must be wasted in the supply circuit.—*Phys. Review*, March, 1915.

Book Reviews

THE ART OF ESTIMATING THE COST OF WORK. By William B. Ferguson. New York: The Engineering Magazine Company. 100 pages. Price, $1.

This publication describes the application of cost-keeping to estimating. The general principles of intensive operation form the basis of the writing. As explained by the author, the data have been compiled exclusively from naval work. The tables and forms are numerous and are made up for definite items in this class of work. Diagrammatic representation of data is discussed and illustrated briefly. To quote from the text, the author has "attempted, by examples, description and reference to the accepted methods of planning and estimating in manufacturing work, the application of the basic principles of logical planning and estimating to the most complex, uncertain and unstandardized kind of work in the world, namely, repairs and alterations of vessels." The general reader in cost accounting finds this monograph valuable in so far as it adds another concrete example to this field of study. To the naval architect and constructor the work should prove very valuable and helpful.

A TEXTBOOK OF PHYSICS. Electricity and Magnetism. Parts I and II. By J. H. Poynting and Sir J. J. Thomson. Philadelphia: J. B. Lippincott Company. 346 pages, 246 illus. Price, $3.

This volume contains Parts I and II of the subject "Electricity and Magnetism" in the series forming the complete "Textbook of Physics." It treats of static electricity and magnetism, and will be followed by Part III as a separate volume, in which electromagnetism will be treated. The volume here considered deals with phenomena of electric and magnetic systems when charged or magnetized. The ground covered is generally the same as that covered in other textbooks, but in the presentation and treatment the authors have followed their own methods. In Part I, which treats of static electricity, the subjects covered include: Quantity of electrification, the "inverse square" law, the electrostatic field and the electric strain produced in it, the forces on a charged body in the field, the energy in electrified systems, potential and capacity, stresses in the dielectric, specific inductive capacity, pyroelectricity and piezoelectricity. Part II, which deals with magnetism, begins with the usual general account of magnetic attraction and repulsion, methods of magnetization, electromagnets, etc. Then follow chapters on the molecular hypothesis, a study of some practical magnetic fields, induced magnetization, magnetic forces and stresses, measurement of permeability and susceptibility, terrestrial magnetism, and magnetism and light. No attempt is made to consider the subject from the engineering viewpoint, but for the purpose of the physicist and student it is well handled and clearly explained.

Books Received

Telegraph Engineering. By Erich Hausmann. New York: D. Van Nostrand Company. 406 pages, 192 illus. Price, $3.

Constant-Voltage Transmission. By Herbert Bristol Dwight. New York: John Wiley & Sons, Inc. 116 pages, 14 illus. Price, $1.25.

Engineering Office Systems and Methods. By John P. Davies, M. E. New York: McGraw-Hill Book Company, Inc. 544 pages, 244 illus. Price, $5.

Sanitary Refrigeration and Ice Making. By J. J. Cosgrove. Pittsburgh: Standard Sanitary Manufacturing Company. 340 pages, 103 illus. Price, $3.50.

Advanced Theory of Electricity and Magnetism. By William S. Franklin and Barry MacNutt. New York: The Macmillan Company. 300 pages, 217 illus. Price, $2.

RECENT TELEPHONE PATENTS

Common-Battery System

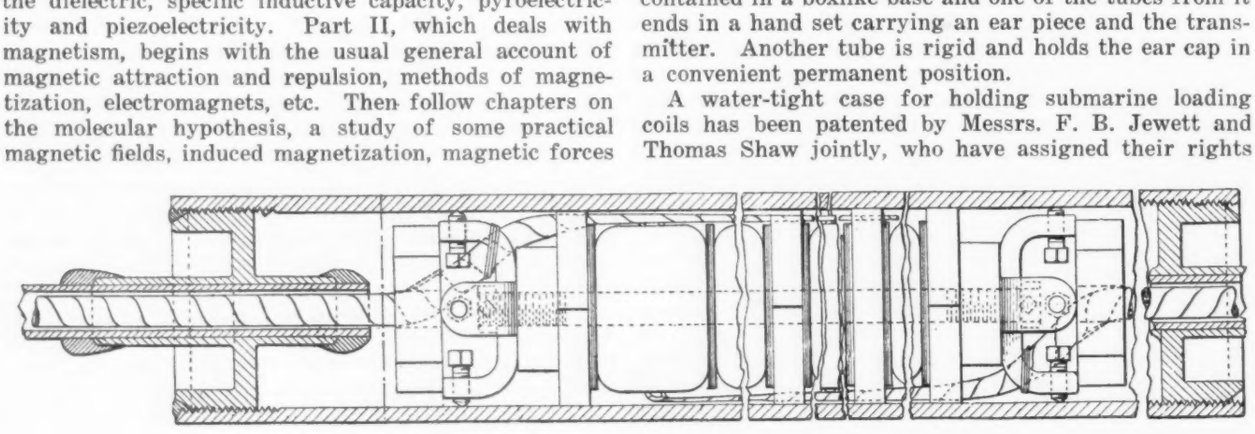
The essential feature of the system patented by Messrs. J. W. Lattig, of Glenside, Pa., and C. L. Goodrum, of Urbana, Ohio, is the use of a common battery installed at the exchange. The battery is grounded in such a way that more calls pass through one portion of it than through the other. Signals are sent by grounding one or the other side of the line by means of polarized double-wound relays, which are automatically released by simultaneous ground connections. The patent has been assigned to the Western Electric Company.

Telephone Apparatus

Mr. N. Pedersen, of Genoa, Ill., has patented a desk-stand telephone set for use on systems where the central-office signals are controlled by momentary contacts at the subscribers' station. With this apparatus the contact controlling the central-office signals is maintained practically throughout the stroke of the receiver hook, thereby insuring the transmission of the signal. The patent on this apparatus has been assigned to the Cracraft-Leich Electric Company.

Messrs. F. L. Jensen and E. S. Pridham, of Napa, Cal., have devised tubes for transmitting sound from telephone receivers to the ear. The receiver proper is contained in a boxlike base and one of the tubes from it ends in a hand set carrying an ear piece and the transmitter. Another tube is rigid and holds the ear cap in a convenient permanent position.

A water-tight case for holding submarine loading coils has been patented by Messrs. F. B. Jewett and Thomas Shaw jointly, who have assigned their rights to the Western Electric Company. The accompanying illustration shows how the coils are supported in a cradle and how the cable sheath is sealed to the case. A screw joint is employed between the head and the shell, the edges of which are burned together with an oxy-acetylene flame to prevent leakage.

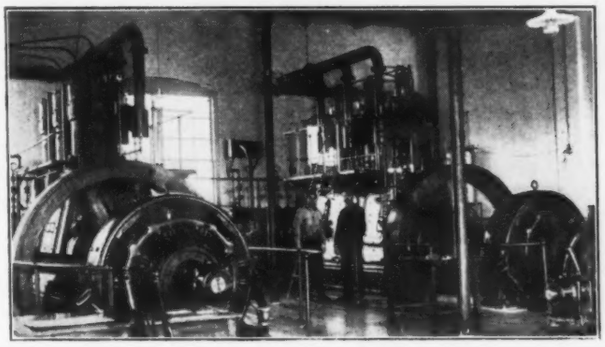


WATER-TIGHT CASE FOR SUBMARINE LOADING COILS

POWER AND OPERATING SECTION

Oil Engines Successful Standby Equipment for Hydroelectric Plant

At Thief River Falls, Minn., a city of 4000 inhabitants, the municipal electric station receives its energy during a part of the year from generators driven by two 200-hp Leffel waterwheels. When the flow of Thief River becomes reduced to such an extent that the waterwheels will not carry the load, use is made of two gen-



OIL-ENGINE PLANT USED AS CENTRAL-STATION RESERVE

erators connected to two 225-hp Busch-Sulzer Diesel engines. Before the convention of the Minnesota Electrical Association Mr. Leonard Peterson, superintendent of the municipal station, spoke very highly of the service rendered by these engines. Four or five minutes, said he, is the length of time generally required to put these units into service, and in the three years they have been installed not a single shut-down has been experienced in the plant. During that time the generators to which the Diesel engines are connected have produced 800,000 kw-hr. Fuel oil of the grade used (39 deg. Baumé) costs 5.5 cents per gallon delivered at the station supply tanks. Running on this grade of fuel, the engines consume a gallon of oil for each 10 kw-hr. generated, making the fuel cost 0.55 cent per kw-hr. Not a cent has been spent for repairs in the three years the engines have been operated, concluded Mr. Peterson. The regulation of the engines is good, and they can be operated in parallel.

Burning Coal Without Smoke in Hand-Fired Furnaces

In a paper entitled "Hand-Firing Soft Coal Under Power-Plant Boilers," issued by the Bureau of Mines, Mr. Henry Kreisinger says the conditions necessary for a complete combustion are sufficient air supply, intimate mixing of the air with combustible gases, and maintaining the temperature high enough to insure ignition of the combustible gases while they are being mixed with the air. When thick fuel beds are employed there is difficulty in forcing sufficient air through the grates to support combustion, therefore some must be admitted over the fuel bed. In general the best method of admitting additional air is the one that affords the best mixing of the air with the gases rising from the fuel bed. If air be admitted through the furnace door and also through tuyères in the bridge wall, thorough mixing will usually take place. Better results will, of course, be obtained if the air is forced through the bridge-wall openings under pressure. Another method of mixing gases and air is by steam jets, which are usually placed in the front wall above the firing doors. The streams of steam cause a whirling motion over the fuel beds which tends to mix the gases with the air entering through the firing door. Still better results seem to be obtained when air is admitted through small openings around the steam jets instead of through the fire door, because the steam jets then act like injectors. Nozzles should have several small openings made so that they will utilize the expansion of the steam in producing high velocity. It should be remembered that steam does not support combustion and is merely the mechanical mixing agent.

In furnaces where a large part of the boiler heating surface is exposed to the fire, burning gases and particles of carbon may be chilled before they are completely burned and thus escape through the chimney as visible smoke. This is especially liable to occur where the gases move slowly, as they usually remain stratified.

Coal Truck Dumped Electrically

A 35-hp, 2-ton truck which is used to haul coal from the cars or from storage to the uptown generating station of the Dayton (Ohio) Power & Light Company is equipped with a 1-hp, 110-volt motor which dumps the truck's contents into a bunker beneath the sidewalk outside the plant. The driver of this truck can make about thirty-five round trips a day. When he backs up the truck to the curb, as it stands in the illustration herewith, he trips a hand lever releasing the bottom of the hinged end gate; then, taking a flexible cord which is carried on the side of the truck and which terminates in an attachment plug, he connects the motor to a 110-volt circuit brought to the curb through the 3-in. pipe standard shown at the edge of the coal pile. The operator next starts the small motor by closing a double-pole, single-throw switch incased in the small sheet-iron box attached to the truck frame. The forward end of the truck body is then hoisted by the motor operating through a set of gears and a pair of curved gear racks. Unless it is blocked, the truck body descends by gravity when the switch is opened, and by the time it is down the driver has withdrawn the attachment plug from its

COAL TRUCK DUMPED ELECTRICALLY

socket in the curb standard, has coiled up the flexible copper-wire cord and is ready to start for another load of coal. The unusual speed with which the truck can be unloaded not only allows the driver to get the most out of the car but also betters general traffic conditions, because it reduces to a minimum the time that the truck must necessarily stand backed up to the curb.

Solving Feed-Water and Condensing Water Problems at Kokomo, Ind.

For several years feed water for the Kokomo (Ind.) station of the Indiana Railways & Light Company was obtained through pipe lines more than a mile long laid in the bed of a nearby creek and reaching to a point

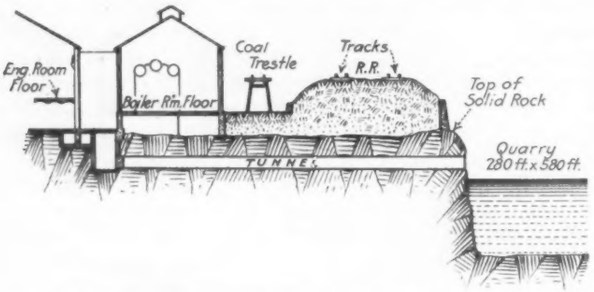


FIG. 1—SECTION THROUGH CIRCULATING WATER SYSTEM

above the gas scrubber of glass works, where the water was unpolluted. Conditions in this creek have, however, now been improved, the glass company and the central-station company having shared the expense of laying a sewer to conduct the polluting material from the scrubber to an adjacent sand field which acts as a filter and arrests all solid matter. In addition to benefiting the power plant, this work will improve sanitary conditions in the city through which the stream flows.

While the creek referred to supplies enough water for the condensers in the electric-light plant during the winter months, there are times in the summer when the water supplied is very warm and the flow is small. To remedy this condition a tunnel was driven from the power house to an abandoned stone quarry 150 ft. away. This quarry, measuring 280 ft. wide by 520 ft. long by 50 ft. deep, is fed by springs which, whenever the water level is lowered 25 ft. below the top, deliver approximately 800 gal. of water a minute. Water is drawn through the intake pipe by a De Laval pump driven by a 40-hp motor and capable of delivering 3000 gal. of water per minute.

The quarry pump discharges both into the intake well

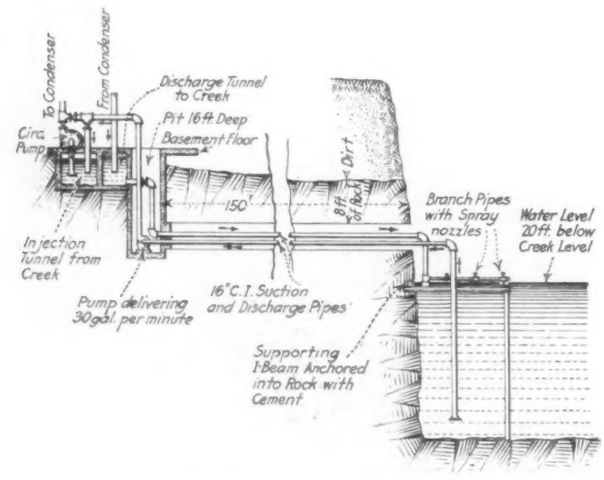


FIG. 2—ARRANGEMENT OF CONDENSER WATER LINES AT KOKOMO PLANT

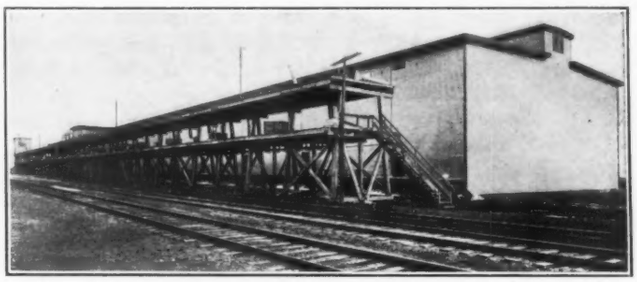
and the inlet of the surface condenser of a 3750-kva turbine. This connection into the surface condenser gives the latter two sources of water supply, since its main 9000-gal. circulating pump draws water from the intake well, which is fed by a tunnel from the creek. After the water has been used it is returned and sprayed into the quarry. Inside the station the three jet condensers and one surface condenser are connected to an intake well, this scheme being favored in preference to a common header as there is less tendency under these conditions for the machines to "rob" each other, one of the jet condensers ultimately losing all its vacuum.

Another possibility considered was that of raising the head of water in the quarry by pumping in water from the creek and utilizing this potential head. On account of the fact, however, that the creek water carried some impurities, and because a high head in the quarry would result in seepage to nearby wells and would probably reduce the flow of the spring, this plan was abandoned. Mr. P. H. Palmer, assistant general manager of the company, superintended the work of reconstruction.

Electric Drive in a Large Ice House

Nearly 100 hp in 440-volt, three-phase motors is installed in the new 40,000-ton ice house of the Michigan Central Railroad at its West Detroit yards. The huge frame building measures 87 ft. by 580 ft. in plan and is divided into fifteen sections. All ice is loaded and unloaded by electric power, and ice can be delivered in cakes or crushed, as desired.

Four 15-hp motors operate the elevators. By the



EXTERIOR OF ICE HOUSES

arrangement of cables employed each motor can be connected to drive either one outside or one inside elevator. This feature reduces the number of motors to four instead of eight, as would be necessary were each elevator individually equipped. The inside elevators are not in use when the outside elevators are being operated, and vice versa.

The conveyor in the monitor is driven by a 10-hp motor, and a 7.5-hp motor operates the ice crusher. For the platforms two 7.5-hp motors and a 5-hp conveyor unit are installed. At the east end of the ice house is the salt room. Here a 3-hp motor is used to drive a belt conveyor to elevate the salt into the storage bins.

Steam Consumption Guarantees of Small Non-Condensing Turbines

BY W. J. A. LONDON

The introduction on a commercial basis of the small turbine has been responsible for many surprising changes in ideas and general practice in power-house work. One of the most pronounced is the introduction of that most remarkable and elusive term "steam consumption," a factor heretofore unthought of and one might almost say absolutely unknown when talking about auxiliary machinery.

Not often in the past did the purchaser buy a reciprocating boiler-feed pump under a steam-consumption guarantee, neither did he consider it the prime factor

in deciding the type of pump to adopt; yet to-day persons asking for alternative bids on turbine and reciprocating pumps insist on specific guarantees based on tests conducted at maker's works, and sometimes on the site. The buyer haggles for days over the two guarantees made by competing turbine builders because one is a pound less than the other, and may then decide to buy a reciprocating pump with a steam consumption double that of the worst turbine built.

Before going any further the author wishes to point out that he fully appreciates the absolute necessity for low steam consumptions in certain installations such as isolated lighting plants and industrial plants where only a certain quantity of exhaust steam is required, but machines sold for these plants represent only a small percentage of the total output of any small turbine builder, the majority being supplied as auxiliaries to the larger power houses where all the exhaust steam can be used in the most economical manner known. Moreover, reference is made in this article exclusively to non-condensing machines, although in many cases the same arguments are applicable to condensing units.

When buying a reciprocating boiler-feed pump a person does not look for one having the lowest steam consumption, but one that will do the work with the least amount of attention and at the smallest maintenance cost. However, persons are now demanding all sorts of steam consumption guarantees from the turbine maker, having forgotten all the old ideas regarding reliability. Sight should not be lost of the fact that high economy in steam consumption can be obtained only at the sacrifice of simplicity and reliability. The elaborate Corliss valve gear, necessary for efficiency purposes, does not increase the reliability of the machine.

There can be no doubt that true economy is essential. We can no longer afford to throw away the by-products of manufacture as we did ten years ago. The building of 30,000-kw machines in a single unit to reduce the steam consumption is based on sound engineering principles, but the arguments in favor of low consumption are by no means applicable to the small auxiliary units.

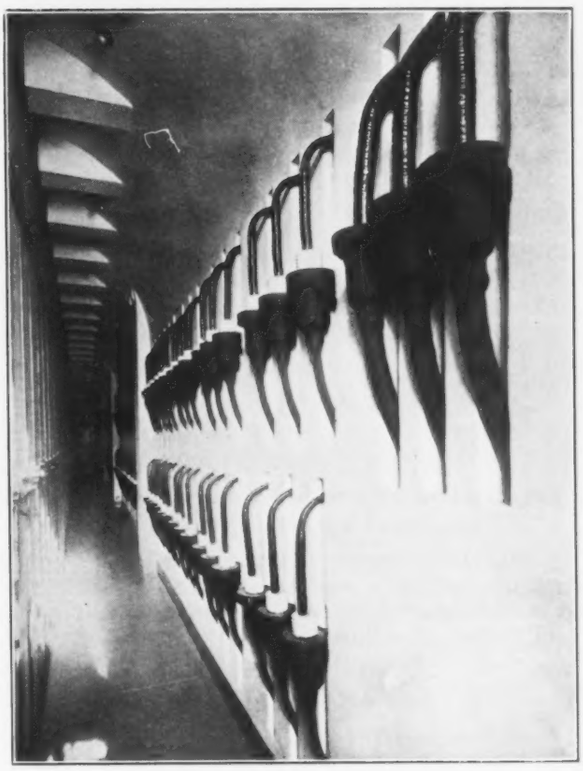
The writer wishes to record his plea for a better understanding of the term "efficiency" when applied to small turbines. Of paramount importance is not the steam consumption but the commercial efficiency, which takes into account not only the consumption but the maintenance, the repairs and the wages paid to the attendant. A simple turbine requires only unskilled help, while a complicated machine necessitates an engineer. A reduction of 1 lb. per hp-hr. in the steam consumption of a large machine is a big factor, but in a 50-hp auxiliary equipment the cost is only about $85 per year.

One other point of inconsistency is that concerning the relation between the actual service performance and the guarantee. For example, a customer ordering a 50-hp turbine to operate under 150-lb. pressure at the throttle with a 2-lb. back pressure may ask for a guaranteed steam consumption of not over 40 lb. per hp-hr. at full load and 41 lb. at half-load with the jet valves closed. Under actual operating conditions the consumption may reach 50 lb. per hp-hr. with the valves left open, but the purchaser is unaware of this. He seldom cares what the consumption is, although he was probably willing to pay an extra high price to obtain a low guaranteed steam consumption.

This article, which was written from a turbine engineer's standpoint, may read like an argument to evade responsibility and to discourage the practice of making any guarantees at all. Such an assumption would not be true, however. The guarantees demanded by the market are being met. The testing plant of turbine works is considered just as important as the machine shop, and apparatus is provided so that the customer can make his own test any time. The day of "fake" guarantees is over.

Installation of Cables Leading to Switch Compartments

In constructing its 187th Street substation the United Electric Light & Power Company, New York City, installed fiber ducts in the walls, floors and ceilings so that cables can be readily pulled in or removed therefrom. To avoid sharp bends where the cables pass up a wall and then across a ceiling to switch compartments the ducts were made to follow a large radius curve through which the cables can be easily pulled without injury to the insulation. Openings were also made in the ducts at intervals with provisions for installing medium-length cables connected by easily accessible joints. The accompanying illustration shows outlets in a number of wall ducts with the potheads held in brackets which support the weight of the vertical cable sections. The walls are white and the cables, joints and brackets black.



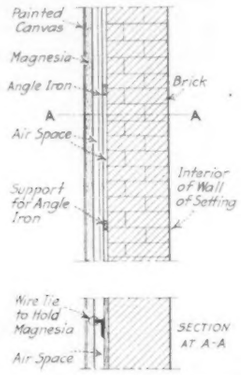
DUCT OUTLETS AND CABLE-JOINT SUPPORTS

Lagging Furnace Walls to Stop Heat Loss

Tests conducted in the generating station of the Springfield (Ohio) Light, Heat & Power Company showed that there was 70 deg. Fahr. difference in temperature between the air close to the brick wall of the boiler settings and air in the same horizontal plane out in the middle of the aisle space. Upon the discovery of this condition, indicating considerable loss of heat by radiation, Mr. Weare Parsons, treasurer and manager of the Springfield company, was led to believe that a coat of lagging on the exterior of the boiler setting walls might quickly pay for itself.

It is known that a 2-in. coat of magnesia lagging on

a live-steam pipe under ordinary operating conditions will reduce the surface temperature about 165 deg. Fahr., and it was with this fact in mind that the boiler lagging shown herewith was designed. Plans are being made to use this type of lagging at Springfield. Directly against the brick, supports for vertical angle irons are to be placed; the magnesia is to be supported



LAGGING WALLS OF BOILER SETTING

against the angle irons and held in position by tie wires, and over the magnesia a heavy layer of canvas will be stretched. This canvas will be painted after it has been fastened over the magnesia. With this sort of lagging there will be two dead-air spaces and a layer of magnesia, to prevent the escape of heat. The painted canvas, it is thought, will better draft conditions by preventing any air from entering through the pores of the magnesia and brick.

Voltage and Insulation-Resistance Tests for Wires of Various Sizes

In testing large wires and cables for voltage and insulation resistance a variety of incorrect assumptions and methods have been employed in the effort to calculate the proper values for large conductors in terms of the values commonly accepted for wires of ordinary size. Assuming 1500 volts as a fair test on a No. 14 rubber-covered wire, Mr. Henry A. Morss, vice-president and electrical engineer of the Simplex Wire & Cable Company, Boston, Mass., in an address before the Chicago Jovian League, Feb. 15, showed the following

TABLE I—COMPARATIVE VOLTAGE TESTS FOR WIRES OF VARIOUS SIZES

Size	Thickness of Rubber, Inches	Test Pressure, Volts
No. 14 solid	3/64	1500
12 solid	3/64	1626
8 solid	5/64	1842
6 solid	1/16	2418
4 solid	1/16	2544
2 solid	1/16	2650
1/0 stranded	5/64	3396
4/0 stranded	5/64	3552
250,000 circ. mil	3/32	4242
500,000 circ. mil	3/32	4404
600,000 circ. mil	7/64	5106
800,000 circ. mil	7/64	5178
1,000,000 circ. mil	7/64	5226

table of voltage tests for wires of other sizes. In making the comparisons use was made of the formula

$$V = Kd \log \frac{D}{d},$$

where V is the test pressure in volts, K is a constant depending upon the dielectric, D is the outside diameter of the insulation, and d is the inside diameter of the insulation. On very large and heavy cables it is advisable to reduce somewhat the actual voltage used in the tests, owing to mechanical causes. The insulation thicknesses listed in the table are those required by the National Board of Fire Underwriters.

A second table exhibited by Mr. Morss showed comparative insulation-resistance values, assuming an in-

TABLE II—COMPARATIVE INSULATION-RESISTANCE TESTS FOR WIRES OF VARIOUS SIZES

Size	Thickness of Rubber, Inches	Insulation Resistance in Megohms per Mile	
		Stranded	Solid
No. 14	3/64	1000	1000
12	3/64	846	852
10	3/64	713	723
8	3/64	592	606
6	1/16	623	633
5	1/16	566	578
4	1/16	518	529
2	1/16	423	437
1	5/64	461	....
1/0	5/64	419	....
2/0	5/64	378	....
3/0	5/64	343	....
4/0	5/64	310	....

sulation resistance of 1000 megohms per mile for No. 14 rubber-covered wire. The formula employed for comparing insulation resistances is:

$$R = \frac{A}{L} \log \frac{D}{d},$$

where R is the insulation resistance, A is a constant depending on the dielectric, L is the length, D is the outside diameter of the insulation and d the inside diameter of the insulation.

Results of a Time Study on Excavating and Handling Material

BY H. A. WOODWORTH

There are few hard-and-fast rules by which a manager can be guided in handling men on construction work, but the accompanying table may in some measure indicate what may be expected of a workman under

RESULTS OF A TIME STUDY ON STEAM-MAIN CONSTRUCTION

Operation	Units per Man-Hour		
	Maximum	Minimum	Average
Removing asphalt, square yard	1.60	1.29	1.45
Removing brick pavement, square yard	3.00	1.25	1.87
Removing concrete (both hard and soft), square yard	3.36	0.57	1.79
Excavating and wheeling, cubic yard*	0.55	0.25	0.40
Laying 12-in. pipe, foot	1.25	0.33	0.8
Setting plates and rollers, pair	1.5	1.0	1.25
Covering 12-in. pipe, foot	15.5	5.3	7.6
Laying 18-in. tile, foot	5.25	0.55	2.9
Back-filling, cubic yard	0.44	0.16	0.3
Concreting, square yard	0.6	0.3	0.42
Sheeting, foot	1.5	1.0	1.25
Pulling sheeting, foot	6.12	4.45	5.0
Laying brick, square yard	0.89	0.31	0.62
Loading wagons, cubic yard	2.57	1.03	1.82

*Note.—Considerable wheeling of materials was required in alley construction.

average conditions. The data from which this table was prepared were compiled from a study made during the construction of a steam-heating line for the Merchants' Heat & Light Company at Indianapolis, Ind., and while the results are chiefly applicable to construction work on pipe lines, some of them may also be of value in estimating labor costs on laying electric conduit lines.

COMMERCIAL SECTION

The Store Wins Wiring Business

MANY electrical contractors have hesitated to enter the field of retail merchandising by establishing an electric shop for the sale of household appliances and accessories, fearing that the detail of store operation would prove too great a burden and seriously interfere with the proper conduct of the contracting business. That this is not the case in fact is demonstrated by the experience of the George Weiderman Electric Company, as described in detail in this issue. The sale of appliances has proved a steady and profitable source of wiring business. It is a most important point.

Win the Architect

THE winning of the architect will be a prominent feature of commercial activity within the electrical industry in the next few years. The fact that the interest of the architect at present is not given strongly to the details of electrical equipment is a costly influence, for it results in inadequate installations where no factor of cost has intervened, and the owner pays a heavy price in loss of comfort and convenience. As the architect becomes more interested in the opportunities which modern electric service offers, he will strive to raise the standard of his work, providing every possible electrical convenience. Thus the problem solves itself.

Checking Overhead Percentages Periodically

AN annual or a semi-annual estimate of an electrical contractor's overhead expense can hardly be said to be sufficient in many cases. In estimating the cost of any wiring installation the overhead expense is usually applied in the form of a certain percentage of the estimated cost of the work to the electrical contractor. This percentage is often assumed to be the per cent the total cost of doing business during the previous year or half year bears to the total amount of business done during that period. Strictly speaking, the percentage overhead figured on this basis is the percentage overhead that ought to have been charged during the earlier period. Since a contractor's business varies in amount from year to year and even from month to month, the percentage overhead figured on this basis is seldom correct for the period in which it is applied. Trial balances of all books can well be made, for example, monthly for the purpose of determining how the amount of business being done and the overhead expense compare with the figures upon which the percentage overhead being employed was reckoned. In this way the electrical contractor can adjust his percentage overhead expense as often as the variations in the amount of business being done seem to demand doing so. If such periodic adjustments of the percentage overhead are not made, it is possible, and often probable, that by employing an overhead figured on business conditions during a previous period the contractor may underestimate the cost of the work performed during periods of depression in his business.

Remove the Mystery

ELECTRICITY is a deep mystery to 90 per cent of the domestic users of energy. Steam and gas, being tangible, need no explanation, but the illumination of a room or a whole house by merely pushing a small button far exceeds the darkest magic of the East. There is little doubt that many more uses would be made of electrical energy if the housewives possessed a better understanding of it. A certain number of cubic feet of gas gives a definite impression of volume, but to many housekeepers a kilowatt-hour is a weird term of hidden meaning. Greater effort should be made to impress on every man and woman the simple, lucid explanations that convert electric service from a mystery into a kindly household friend.

Friendship

THE central-station companies, particularly the larger ones and their subsidiaries, have gradually discarded the "public be damned" policy and adopted the "public be pleased" policy. It pays. The companies have found out that they need friends. Service is not the only thing. The complaining customer who receives a polite and satisfactory explanation of his abnormally large bill becomes the company's stanch friend. The fussy housewife who notices that the meterman wipes his shoes before he enters the house and greets her politely becomes a valuable asset for the company.

Co-operation

WHEN the central-station company enters the contracting and wiring field there is shown on the part of the local contractors and the company a lack of co-operation which only serves to widen the existing breach and to cause both parties a substantial loss. The lighting companies lose the new business that they would otherwise receive through the creative activities of the contractors, and the contractors lose by the consequent curtailing of their opportunity. By co-operating with the central station the contractor can furnish lower estimates and thereby place a smaller burden on the prospective lighting customer. The result will be a great increase in business for both.

Handicap for Salesmen

Commercial representatives of central-station companies who have the title of "contract agent" labor under a serious handicap, according to Mr. E. R. Kelsey, of Toledo, Ohio. That appellation, said Mr. Kelsey before a meeting of commercial men of the Ohio Electric Light Association, does not lend the dignity and impressiveness which the title of a central-station company's commercial man should convey. The word "agent" in the title may lower the sales manager's standing with men who do not know the nature of the central-station commercial man's work. To take down the barrier which such a title sometimes interposes between the commercial man and his prospective customer, Mr. Kelsey recommended that the word "salesman" should be always used in place of "solicitor" and that the title "sales manager" be substituted for that of "contract agent."

It will be well to go a step further and discard the name "new-business department" in favor of the more appropriate designation "sales department" or "commercial department." Five years ago the idea prevalent among central stations was that the sole function of the salesman is to secure new business. But to-day it is pretty generally recognized that the re-vitalization of dead services and the development of greater consumption from existing customers presents a far more alluring opportunity. "New business" means a new service extension and an additional investment. Re-connection of a dead service or the increasing of a present customer's consumption brings additional revenue without a cent of extra cost. It restores dormant invested capital to active earning power, or increases its rate of interest return.

The Haulage Problem and Loading Efficiency

The superiority of the electric truck for short hauls in the congested portions of a city where service requirements are severe is well shown by operating data on the electric trucks of the Curtis Publishing Company of Philadelphia, presented in this issue. In considering the savings effected by the use of electric trucks and modern methods of handling materials at the plant and warehouse, the reader should bear in mind that the results cited were obtained under the most conservative operating conditions, with liberal allowances for the maintenance and care of the machines. The figures therefore constitute no mere paper record of efficiency, but report actual operating results under conditions of care and attention which insure the longest life and most dependable operation of the trucks.

But one of the most interesting facts revealed by the data given is that the efficiency of the truck service is considerably reduced because of time wasted in loading and unloading at the post office, the railroad station and the numerous wharves along the Delaware River. Conditions at the latter are particularly deplorable. Generally speaking, little effort is put forth at the docks to insure the efficient maneuvering of vehicles or the expeditious unloading and loading of the trucks. Here, too, the cheapest and most inefficient classes of labor are employed for the handling of the freight. While at the publishing company's plant and warehouse the use of demountable bodies and other electrically and manually operated labor-saving machinery has enabled the company to reduce the time of unloading and loading to a minimum, further increases in the efficiency of the truck service are possible only through improvement in freight-terminal conditions.

Negotiations begun by the publishing company with the railroads and with the post office to have equipment installed on their platforms similar to that employed at the company's plant and warehouse for the handling of mail and freight are, of course, steps in the right direction. The installation of such equipment at railroad freight yards, post offices and even docks would do much toward reducing the haulage costs of other large companies as well. Many other shippers would welcome having portions of the platforms at these places equipped with modern machinery for loading and unloading trucks. However, negotiations for the installation of such equipment seem to proceed slowly when broached by a single shipper or individual interest. Co-operative efforts of a number of shippers would be more effective. Better still, were the efforts of a national society like the Electric Vehicle Association of America enlisted, a broad and effective attack might be begun on the general problem of handling materials at freight terminals, post offices and docks which would bring relief.

Wiring on the Percentage Basis

Much of the inferior wiring done to-day is the result of the straight-contract method of doing business. Unforeseen difficulties such as obstructions, the rapid progress of building operations, etc., often increase the labor item far beyond expectations. In order still to make a profit or to reduce his loss, the contractor skimps on materials or uses inferior grades, with the result that the customer does not obtain the type of installation which he desires, and the electrical contractor gains nothing in the end.

Although much can be said against the percentage system of doing electrical contracting, it possesses certain merits. One of the essential requirements for the successful operation of the percentage system of contracting is that the customer and the contractor have confidence in each other. Where such is the case it is well for the contractor to explain the merits of this system and to attempt to obtain the business on the percentage basis. In many cases the contractor doing work on the percentage basis is not required to guarantee that the cost of the work shall not exceed a certain specified sum. Where such a guarantee is employed the contractor can generally specify a sum great enough to cover all requirements, under which condition the customer obtains good work and the electrical contractor is free to suggest any desirable changes in the original plans or specifications with profit assured.

Competing for Appliance Business

Analysis of the Merchandising Methods and Policies in Successful Electric Store Where Service to the Customer Wins

"ONLY a day!" exclaimed the woman who had brought her flatiron to be repaired. "Good! Then the ironing can be done to-morrow—the regular day. I took it to the department store, but I was told there that it would have to be sent to the factory and would take a month. They advised me to buy a new one. I'll never buy another electrical device from the department store."

This is an instance that Mr. Weiderman quoted to illustrate the character of the service that is rendered at the store of the George Weiderman Electric Company, 191 Flatbush Avenue, Brooklyn, N. Y., in support of his assertion that in order to compete with department, drug and hardware stores in the sale of household electric heating and cooking devices it is necessary for the electric shops to outstrip these stores in the underlying principle of all successful businesses —service.

"A department store employs modern merchandising methods," said Mr. Weiderman, "but so can the contractor or electrical dealer in his store. The department store can do extensive advertising in newspapers and other mediums, but so can the electrical store. But the department store has no facilities for repairing electrical appliances. Generally it cannot give a demonstration of the appliances on sale or make intelligent recommendations. And finally it has no means of obtaining as fine a 'prospect' list as the electrical store. Its clerks are no more than clerks. They have no knowledge of electrical appliances and cannot supply the correct type of device from the mere knowledge of the section of the city in which it will be used. Moreover, the central station usually offers no repair facilities beyond the mere replacing of fuses. This gives distinct advantage to the Electric Shop, and the George Weiderman Electric Company is striving to conduct its retail business along such lines as will render service surpassing that of all the non-electrical competitors.

Merchandising Methods in the Store

The accompanying illustrations show the interior of the Weiderman store and a view of the show window. It will be noticed that a very good assortment of appliances are on exhibition, some of them in cases and

FIG. 1—THE GEORGE WEIDERMAN ELECTRIC COMPANY IS A BELIEVER IN ATTRACTIVE INTERIORS

others displayed on the tops of the cases and on tables, in order that customers may handle and examine the devices just as they are accustomed to in the department store. A dressing table is employed for the display of curling-iron heaters, electric vibrators, electric hair driers, and other electrical toilet accessories, as shown in Fig. 2. A good idea of the merchandising methods employed was afforded by a sale effected one day in the writer's hearing.

Upon entering the store, the prospective customer was greeted by a courteous saleswoman, who invited her to be seated at one of the two demonstration tables provided in the store. The lady wished to look at coffee percolators, and the saleswoman proved to be very conversant with the fundamental principles of coffee making—in fact, as Mr. Weiderman afterward stated, she is an extensive user of household electric heating, cooking and motor-operated appliances in her home. She proceeded to place on the table various types of coffee percolators and explained their merits. The customer was not forced to inquire constantly the prices of the appliances shown, for every appliance both in the show window and in the store had attached to it a price tag giving the information in plain figures.

When a demonstration of the device was requested, the saleswoman attached it to a baseboard outlet, commenting at the same time upon its convenience in the home. The prospective customer, with the usual lack of knowledge of the names of electrical devices, inquired whether it would be possible to have some of those "things" in the baseboard put into her home, so that she wouldn't have to unscrew lamps. When told that it would be a matter of small expense to install baseboard outlets in her home, the customer stated that she would see her landlord about it that very day. The saleswoman casually requested the name of the landlord.

The sale of a coffee percolator was effected, and the saleswoman called the attention of the purchaser to "some of the more recent electrical appliances." This led to a demonstration of a vacuum cleaner, but the customer, upon noticing the amount marked on the price tag, remarked that she couldn't afford to buy one. The saleswoman then proceeded to explain that the company sold such devices upon the part-payment plan, requiring only small monthly payments. In this way another sale was effected, careful note being made of the section of the city in which the cleaner was to be used so as to supply one suitable to the electric service in the section. The customer left the store well pleased with the service she had received, and immediately the contracting department was instructed to follow up the landlord and sell the extra outlet if possible.

FIG. 2—READY FOR A DEMONSTRATION TO THE CUSTOMER

Price tags are attached to all articles in the Weiderman store and in the show window, for the reason that this custom stimulates the public to familiarize itself with the prices of electrical appliances. It is believed that anyone is more likely to buy an appliance when he knows that it comes within his means, as is shown by the price tags, than if he has no knowledge of prices whatsoever. The saleswomen in the store are instructed to recommend additional baseboard outlets, taps, etc., when selling devices, doing so in a way which will have no bad effect upon the customer's opinion of the store or its service. Where desired, the company also demonstrates devices in the home, and always when a sale is once made a record of it is maintained for use in connection with the company's advertising and house-to-house visits.

FIG. 3—THIS FLATBUSH AVENUE STORE FRONT IS ONE OF BROOKLYN'S BRIGHT SPOTS AT NIGHT

Interdependence of Store and Contracting Business

Mr. Weiderman stated that his store and his electrical contracting business have proved exceedingly interdependent. The store has attracted people desiring electrical contracting work, while the wiring of homes and stores has led to the sale of appliances. The fact that the company loses a bid in no way prevents it attempting to sell appliances, so even unsuccessful bidding may result in sales being made. In fact, Mr. Weiderman says that, combined, the two businesses act as a splendid advertising medium for each other. Many are the cases where the wiring of homes has enabled the company to sell a number of appliances, and many are the cases where the sale of appliances has enabled the company to obtain contracts for the installation of baseboard outlets and switches. The show window and the store he considers to be about the best type of advertising possible for his electrical contracting business. They impress themselves upon the minds of passers-by, and when such persons are in the market for electric wiring they are very apt to follow the path of least resistance and call at his store.

Fig. 5 shows a view of the Weiderman show window. The display is changed once a week, and extensive use is made of suggestions and material secured from manufacturers and the Society for Electrical Develop-

ment. All articles displayed are provided with price tags so as to familiarize the public with the cost of electrical appliances. Both stationary and motion displays are employed from time to time, Mr. Weiderman believing that the electrical contractor should advertise by means of electric signs, and an electric window sign is used in connection with many of the displays. The

FIG. 4—THE BUSINESS OFFICE IS ACCESSIBLE TO CUSTOMERS

windows and the store are well illuminated at night. and in front of the building an ornamental lamp-post gives additional light and attracts further attention, On top of the building is an electrically illuminated sign (Fig. 3) reading "Geo. Weiderman Electric Co. We Electrify Your Home, Office and Factory."

To prove the importance of having a place of business which attracts the attention of passers-by and fixes itself upon their minds Mr. Weiderman cited the fact that many persons living in Brooklyn and having offices in Manhattan have stopped in at the Brooklyn store and ordered electric fans to be delivered to their offices in the larger borough. In some cases they even carry the fans themselves to their Manhattan offices. This is particularly interesting in view of the fact that adequate facilities for obtaining electric fans are available in the numerous stores in New York City proper, and because the sales cannot be traced to any other source.

Upon being asked why he employed saleswomen in preference to salesmen in his store, Mr. Weiderman stated that he believed a woman is better able to hold the customer's attention than a man. He illustrated this statement by saying that he also employs a saleswoman who travels about the city demonstrating and selling electrical appliances in the home. A man, he stated, in many cases would be shown the door, but a woman commands more respect. A man will not be rude to a woman, and a woman will hesitate less before admitting a saleswoman into her home than she would in the case of a salesman.

The outdoor saleswoman has in many cases actually been able to obtain electrical contracting work for the company. When asked how he knew that this was so, Mr. Weiderman replied that the records show that she has been the direct means of securing more contracts for house wiring in Brooklyn than any of the company's men employed for that purpose.

Bargain Sales

Mr. Weiderman believes in bargain sales, and for three reasons—first, they are a direct application of department-store methods; second, they advertise not only his store but his electrical contracting business, and, third, they create a desire on the part of the public for the appliances being sold at bargain prices. In this way not only sales of the appliances advertised but sales of other appliances have been effected. Moreover, the company thus obtains the names of the purchasers and adds them to its prospective list of customers for other electrical appliances. The public also gets from these sales some idea of the type of service which the store renders.

"Prospect" List and Follow-Up of Customers

Numerous methods are employed for obtaining a "prospect" list for electrical appliances. Records are made of the names and addresses of all persons buying electrical appliances from the company. Efforts are made, with very good success, to sell devices when wiring a home. Use is also made of the directory and of real-estate journals. The saleswoman also goes from door to door not only selling appliances but obtaining information as to whether or not the houses visited are wired for electricity. This information is, of course, valuable in the contracting department, and when it is learned that a house is not wired efforts are made to induce the owner or occupants to have wires put in. Card records are maintained giving the name of the customer and the appliances sold as well as names of prospective customers.

Extensive use is made of the daily newspapers and theater programs as a means of advertising devices and of obtaining new customers. Advertising literature is sent out to customers and prospective customers once a month, including advertising material furnished by manufacturers and the Society for Electrical Development. The booklets obtained from these sources are conspicuously displayed in racks in the store, so that customers desiring any literature can easily find what they want.

A Follow-up Letter

In cases where the firm knows already that the home

FIG. 5—ATTRACTIVE WINDOW DISPLAYS BRING BUSINESS

is wired a one day's notice of the call of the house-to-house saleswoman is given. This is done by a personally addressed typewritten letter of the following nature:

"DEAR MADAM:—Our representative, Miss S. E. Kilbourn, will call on you Monday with reference to showing you some of the most recent electrical appliances which are being introduced in

every home. We should appreciate it very much if you would give her your attention for a few minutes, as we feel sure that what she has will interest you. Thanking you in advance for this courtesy, we are, very truly yours,

"George Weiderman Electric Company,
(Signed) "George Weiderman, President."

The letter, Mr. Weiderman maintains, arouses a person's curiosity and generally insures a cordial reception of the company's representative. One reason for this is that the letter arouses interest by the use of the expression "most recent electrical appliances which are being introduced in every home." The recipient of the letter wants to know what these "most recent electrical appliances which are being introduced in every home" are, and hence is willing to obtain the information from the company's representative at a minimum expenditure of time.

Another type of letter that is frequently sent out makes a direct appeal, citing the investment value of electric wiring and soliciting an opportunity to submit an estimate. The value of this latter type of letter can be estimated by the number of people who as a direct result write or call in regard to wiring, and by the number of people calling at the store to see devices and mentioning the letter. Such returns have proved to Mr. Weiderman that advertising of this kind pays.

The letters referred to are by no means "form letters," and their wording, of course, varies from time to time with the nature of the subject and according to the person addressed. When following up the first letter, the representative, in making her call, has an opportunity to learn of any defective appliances, any need for additional outlets, taps, etc. She is therefore invaluable to the contracting department. As previously stated, she is also able to furnish the company with valuable information in regard to prospective customers for house wiring. Hence her salary and expenses are not entirely chargeable to the appliance-sales business, but also to the electrical contracting business. In fact, it is doubtful in which field she is the more valuable, the returns often coming in a very indirect manner.

Credit Methods

Many devices, especially those of higher price, are sold on the part-payment plan. In general, easy monthly payments are arranged for, a record being kept of any inability or difficulty in collecting payments on previous appliances from the same person. The loss due to inability to collect is about 5 per cent. Such machines as washing machines and vacuum cleaners are often sold on this basis. These machines are actually kept in stock and can be demonstrated in the store. Demonstrations are also given in the home, and free trials are allowed.

The overhead expense in conducting a store Mr. Weiderman finds to be greater than in conducting an electrical contracting business, but each class of business affects the other to so great an extent that it is difficult to say what portion of the effort put forth in building up and maintaining an electrical store should be charged to the contracting business. For this reason, he believes, it is well for the contractor entering upon the sale of electrical appliances to remember that, even while he is waiting for the store to show a profit, investigation may show that it has already done this by increasing the volume of electrical contracting work. The length of time required before a store shows returns is largely dependent upon local conditions, such as the percentage of the population of the city or town which passes the store each day, the extent to which the houses in town are wired and the types of competition existing.

To compete successfully with the department, drug and hardware stores that may be selling electrical appliances, Mr. Weiderman thinks that the electrical contractor should not only employ similar methods but should take full advantage of all opportunities for direct solicitation, employing his ability to demonstrate devices and to offer expert advice, and, finally but not least, rendering service in the form of repairs. In short, successful competition is merely a question of service, and the firm that can offer the better and more expert services under inviting conditions gains the bulk of the trade. The electrical contractor can render service which other stores cannot, and the fundamental features of department-store service are of a type which the contractor can easily adopt. In these facts lies the secret of successful competition with other classes of stores in a type of business which after a reasonable length of time is sure to yield direct and indirect profits of no mean proportions.

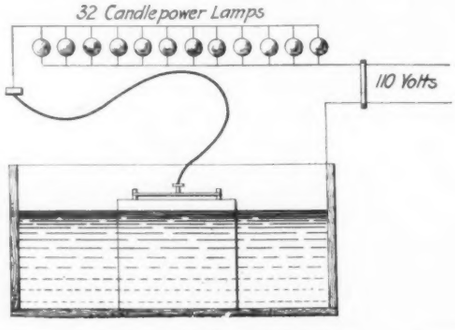
Opportunity of the Electrical Store

When electrical contractors in general realize the opportunity that an electrical store presents, Mr. Weiderman feels that the hardware, drug and department stores will cease to sell electrical appliances, for when the contractor is able to give service superior to that offered by these stores the latter will have the choice of either discontinuing the sale of such appliances or of selling them at a great loss.

Mr. Weiderman feels that when the electrical contractor actually takes advantage of the opportunities offered him, the central stations also will discontinue the sale of electrical appliances. They have been forced to take up the sale of appliances, he claims, for the simple reason that electrical contractors have not in general been awake to their opportunities, and he feels sure that when once the central station discovers that the sale of devices can be efficiently and satisfactorily cared for by electrical contractors it will be more than willing to hand this business to them.

Testing Vehicle-Battery Jars Electrically

For testing vehicle-battery jars, after overhauling the batteries, the transportation department of the Commonwealth Edison Company, Chicago, Ill., makes use of a lead-lined tank to which one side of a 110-volt circuit is connected. The tank is half filled with low-gravity acid and the battery to be tested is immersed in the tank, its plates being connected by a flexible



TESTING BATTERY JARS FOR CRACKS OR FAULTS

jumper to the other side of the circuit through a bank of twelve 32-cp lamps. Any leak or fault in the receptacle is then quickly brought to notice by the existence of a current, which usually burns a hole in the jar. Faulty jars thus discovered are broken up, and the sound sides and bottoms are used for the purpose of covers.

Service Rules of Twelve Central Stations

Similarity of Regulations Is Noticed in Practice of Large Operating Companies of East and Middle West

BEFORE equipment to be operated with central-station energy is installed, contractors are usually required to apply to the electric-service company for information regarding service entrance and meter location and rules governing the particular work to be done. Service rules which have been adopted by twelve central-station companies in this country are tabulated in the accompanying chart, which was incorporated in a paper presented recently before the Brooklyn company section of the National Electric Light Association by Mr. Z. D. Mayhew. All of the companies required balancing of circuits, as well as approval of the electrical work by the city department, fire underwriters or other bodies having authority over such matters.

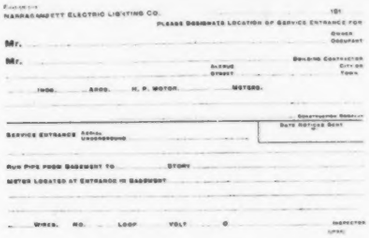


FIG. 1—CONTRACTOR'S REQUEST FOR SERVICE-ENTRANCE LOCATION

Overhead Service

If a consumer desires to have the meter installed in the basement, the contractor is required, with one exception, to run an iron pipe containing the entering cables from a point 15 ft. above the street level to the cellar and provide the lower outlet with meter loops. The Edison Electric Illuminating Company of Brooklyn, on the other hand, extends all overhead services to the basement either by means of a standpipe down the front or side of the building or by placing a service switch on the first floor and running wires to the cellar where the meter is set. Whether the distribution circuit is overhead or underground, the contractor is required to terminate his lines within 3 ft. of the front wall in the basement except when service is supplied from the rear. When underground service is required in Baltimore, Md., or in Newark, N. J., the contractor is required to extend the service from the lowest cross-arm to the basement. For a similar service in Washington, D. C., the electric-service company charges the full cost of the construction from the overhead line to the basement. Some of the companies are allowed to serve several houses from one bus line, twelve connections being allowed in Washington and five being permitted in Brooklyn.

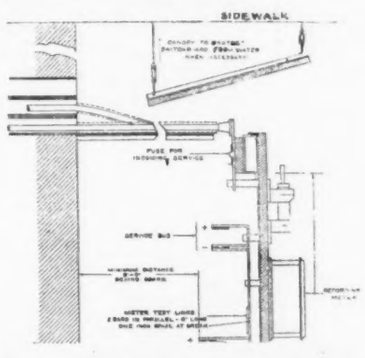


FIG. 2—CANOPY REQUIRED BY CHICAGO COMPANY TO PROTECT SERVICE AND METERS WHEN UNDER SIDEWALK

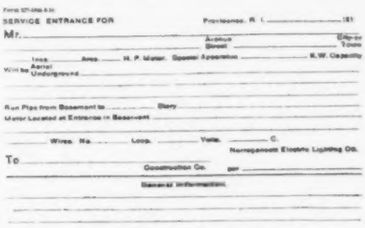


FIG. 3—COMPANY'S REPLY TO REQUEST FOR SERVICE-ENTRANCE LOCATION

Underground Service

When the distributing circuit is underground, the Potomac Electric Company installs the conduit from the service mains to the curb line without cost to the consumer, but from the curb line to the point where the service enters the building the conduit is furnished and installed by the company at the consumer's expense. The Commonwealth Edison Company also bills the consumer for extensions to the underground service inside the property line. With very few exceptions, electric-service companies require the contractor to confer with them before wiring is started so that the location of the meter board may be designated. Failure to submit a wiring report is penalized by the Philadelphia Electric Company by removing the name of the non-complying contractor from a registered list which is issued periodically by the company.

THE PHILADELPHIA ELECTRIC CO.
TENTH AND CHESTNUT STREETS

CONTRACTOR'S WIRING REPORT

Premises..... Occupied by.....
Fixture Work by..... Address.....
New Work Additional Work Changes Repairs

WIRING FOR LIGHT

INC. LAMPS		ARC LAMPS	NERNST LAMPS		FLOOR
NUMBER	C. P.		NUMBER	GLOWERS	

Miscellaneous .....

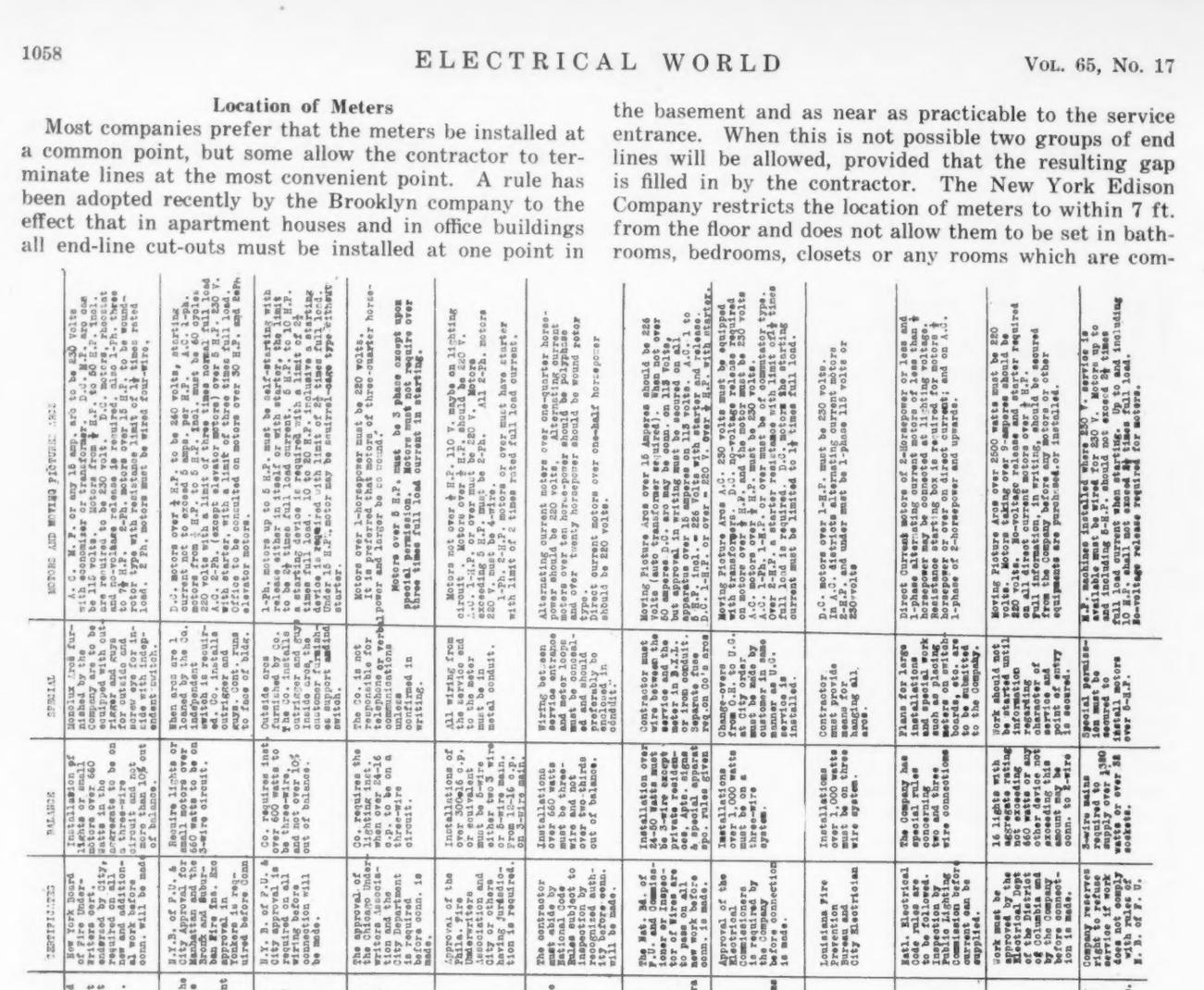
POWER

NUMBER OF MOTORS	H.P. OF EACH	VOLTAGE	PHASE	MAKE	USED FOR	LOCATION

Character of Wiring .....
Remarks .....
Date..... Signed..... Contractor
Address.....

CONTRACTORS WILL PLEASE FILL OUT THIS REPORT AND SEND IT TO THE COMPANY IMMEDIATELY AFTER TAKING CONTRACT FOR WORK.
This report is printed in copying ink

FIG. 4—WIRING REPORT TO BE FILLED OUT BY ELECTRIC CONTRACTOR



CITY	SERVICE	METERS AND CUT-OUTS	CERTIFICATES	BALANCE	SPECIAL	MOTORS AND MOVING PICTURE MACHINES
Edison Electric Illuminating Company of Brooklyn. New York	30- extends service to a point just within walls of building line to basement or cellar. Installs standpipe and cables to basement or cellar in case of overhead service. Co. installs service switch and fuses for same.	Co. installs meter board and does all wiring between the service and the cut-line cut-out. Main-line cut-out required in all cases at the meter location or in the basement or the cellar. If meters are to be set at any point in the cellar other than the service entrance the App must be obtained and the location shown on the plans which must be submitted to the Company for its approval. Meter panel boards are to be submitted to the Company for its approval. The Company supplies emergency service replacing burnt-out fuses.	New York Board of Fire Underwriters rule. Meters are to be set as near as practicable to the service entrance. The App must be obtained and the location shown on the plans which must be submitted to the Company for its approval.	Installation of lights or small motors over 660 watts in the basement is to be on a three-wire circuit and not more than 10% out of balance.	Nonelectrical iron furnished by the Company are to be considered with outfit. Meters from ½ H.P. to 60 H.P. inclusive are required to be 230 volt. Pyg. motors, phocniat to 7½ H.P. Three-phase motors are supplied up to 7½ H.P. These rotor type with resistance limit of 1½ times rated load. 2 Ph. motors must be wired four-wire.	A. C. M. P. or any 15 amp. are to be 230 volts with economizer or transformer. D.C. M.P. are one be 115 volts. Motors from ½ H.P. to 60 H.P. inclusive are required to be 230 volt. Pyg. motors, phocniat to 7½ H.P. Three-phase motors are supplied up to 7½ H.P. These rotor type with resistance limit of 1½ times rated load. 2 Ph. motors must be wired four-wire.
The New York Edison Company. New York	Necessary means for grouping meters when more than three must be provided by the contractor. He is to confer with the Company as to the service entrance, etc., etc. The Co. requires all wiring on service side of meters and cut-outs to be installed in rigid conduit. Not allowed in a place that is not accessible. Contractor must provide fuses for all cut-outs installed by him. The Co. replaces burnt out fuses. The Co. will not install Memo-meters.	N.Y.B. of F.U. & City Approval for Manhattan and the Bronx. Brooklyn, Queens and Richmond Fire Ins. Exc approval in Yonkers is required before Comm	Require lights or small motors over 660 watts to be on 3-wire circuit.	When area are 1 loaned by the Co. independent of the Co. installs outriggers and guys. Co. installs supports. Cont. runs to face of bldg.	D.C. motors over ½ H.P. to be 240 volts, starting current not to exceed 5 amps. per H.P. A.C. 1-ph. motors from ½ H.P. to 5 H.P. incl. must be 60 cycles 220 volts with a limit of three times normal full load starting current. Motors over 5 H.P. must be 2-Ph. 3-Ph. 60 cycle A.C. 220 volts with starter, with a limit of three times full load. Office to be consulted on motors over 30 H.P. and 2-ph. elevator motors.
The United Electric Light & Power Co. New York New York	In private residences and in two and three family houses in the overhead territory no other meter location than the basement or cellar will be approved. Contractors are required to drill switch boards for meters and to secure supplies from Company before installing board. Contractor supplies fuses.	N.Y. B. of F.U. & City approval is required before comm will be made.	Co. requires inst over 600 watts to be three-wire, and not over 10% out of balance.	Outside area furnished by Co. The Co. installs outriggers and guy supports. Cont. furnishes as support and ins switch.	1-Ph. motors up to 5 H.P. must be self-starting with release either in itself or with starter, the limit to be 2½ times full load current. 5 H.P. to 10 H.P. a starting device is required with a limit of 2½ times full load current. Above 10 H.P. a starting device is required with limit of 2 times rated full load current. Under 15 H.P. motor may be squirrel-cage type without starter.
Commonwealth Edison Co. Chicago, Illinois.	Underground consumers must extend wires to Company's service and provide service switch and cut-outs. Overhead consumers must bring wires to building wall 25 feet above the ground.	Meter loops are required, also meter boards to be installed at service entrance. Apartment houses must be wired for meters to be set in cellar. In case of office buildings meters may be installed in a central cabinet in a public corridor of the floor to be supplied. Company gives emergency service for plug type fuses but will not furnish free renewals for cartridge type fuses.	The approval of the Chicago Underwriters Association and the Department is required before comm. is made.	Co. requires the lighting inst. when over 24-16 c.p. to be on a three-wire circuit.	The Co. is not responsible for telephone or signal communications confirmed in writing.	Motors over 1-horsepower must be 220 volts. It is preferred that motors of three-quarter horsepower and larger be so wound. Motors over 5 H.P. must be 3 phase except upon special permission. Motors must not require over three times full load current in starting.
The Philadelphia Electric Company. Pennsylvania	Blanks are furnished by the Company for service and meter locations. Where overhead service is erected the consumer is to install conduit and wires to the cellar from the bracket on the face of the building.	"Wiring Report" to the Company for their approval from registered list issued periodically by the Company. Blanks are furnished by the Company for this purpose. In office buildings and apartment houses meters are to be set in cellar with meter loops in one location. The Co. supplies emergency service. The Co. furnishes service fuses and replaces fuses in case of addl.	Approval of the Phila. Fire Underwriters Association and the City or other authority having jurisdiction is required.	Installations of over 300w16 c.p. or equivalent must be 3-wire either two 3 wire or three 3 wire. Up from 12-16 c.p. on 3-wire main.	All wiring from the service end to the meter must be in metal conduit.	Motors not over ½ H.P. 110 V. maybe on lighting circuit. Motors over ½ H.P. should be 220 V. A.C. 1-H.P. or over must be 220 V. Motors 220 V. must be 4-wire. Motors of 2 H.P. or over must have starter with limit of 2 times rated full load current.
Union Electric Light & Power Company. St. Louis, Missouri.	In overhead territory the Co. runs to service outlet. In underground territory the Co. extends service two feet inside basement retaining wall. Consumer to install conduit, etc. Company supplies service switch and fuses.	The Co. sets meters only at accessible point, preferably in the cellar at the service entrance. Contractor must wire from the service to the meter, provide board and meter loops. The Co. drills all switch boards for meters. The Company supplies emergency service.	The contractor must abide by National Code Rules subject to inspection by Underwriters Association. Before comm. will be made.	Installations over 660 watts must be three-wire and not over two-thirds out of balance.	Wiring between the service entrance and meter loops must be concealed and should preferably be installed in conduit.	Alternating current motors over one-quarter horsepower must be connected to alternating current circuits. Motors over ten horsepower should be three-phase and over twenty horsepower should be wound rotor type. Direct current motors over one-half horsepower should be 220 volts.
The Edison Electric Illuminating Company of Boston. Massachusetts	Company will supply service if within 100 feet of the premises to be supplied. Contractors are required to install underground services in overhead territory. Underground service is installed by the Co. 2 ft. inside bldg line.	Service switches and fuses are installed by the Company. Meters are installed at service entrance in cellar as far as possible otherwise in public corridor or common portion of the building. Contractor is required to install meter-board and meter loops. The Company supplies fuses on hand for emergency. The customer should have extra	The Nat. Bd. of F.U. and Commissioner or inspector of Wired are to be notified before comm. is made.	Installation over 24-50 watts must be 3-wire except in private residences, apts. Rigid conduit must be used. See rules given	Contractor must wire between the service and the meter in B.E.I. or iron conduit. Company furnishes and sets meters.	Moving Picture Arcs A.C. 230 volts must be equipped with transformers. D.C. no-voltage release required on motor over ½ H.P. and the motor must be 230 volts. A.C. motors over ½ H.P. must be 230 volts. A.C. 1-Ph. 1-H.P. or over must be of commutator type. A.C. 2-Ph. 1-H.P. or over must be 220 volts. Starting current not to exceed 3 times full load is required. D.C. motors the starting current must be limited to 1½ times full load.
Consolidated Gas, Electric Light & Power Co. Baltimore Maryland.	Underground service is brought by Company to building line. Customer provides duct for Co.'s cable to within the property line of the building to the cellar. Company furnishes conductors from line pole down same into U.G. duct to cellar.	The service switches installed by the Company. Meters are installed in cellar on first floor for all meters except in office buildings or apartment houses which must be wired to the cellar. If such building has no cellar meter may be installed on the particular floor to which the current is supplied. Under no circumstances are meters to be installed in bath-rooms, closets over doors or in inaccessible locations.	Approval of the Fire Underwriters Commissioners is required before comm. is made.	Installations over 1,000 watts must be on a three-wire system.	Change-over from D.C. to U.C. at City order must be made by customer in same manner as U.C. service is installed.	Moving Picture Arcs A.C. 230 volts must be equipped with transformers. D.C. no-voltage release required on motor over ½ H.P. and the motor must be 230 volts. A.C. motors over ½ H.P. must be 230 volts. A.C. 1-Ph. 1-H.P. or over must be of commutator type. Starting current not to exceed 3 times full load is required. D.C. motors the starting current must be limited to 1½ times full load.
New Orleans Pkwy & B'd Co. New Orleans & Carrollton R.R. Light & Power Co.	Overhead service to connect to provisions made by contractor two feet outside of building extending cable 15 feet above ground in iron conduit. The Company relieves the contractor from all liens before starting to wire.	Service switch and cut-out and all arrangements for meter to be supplied and installed by the contractor although the meter board is furnished by the Company. Location of meter must be secured in writing unless at service entrance. Meter should be installed in a common public place. Company furnishes template for switchboard. Company supplies emergency service.	Louisiana Fire Prevention Bureau and City Electrician	Installations over 1,000 watts must be on three wire system.	Contractor must provide means for hanging all arcs.	D.C. motors over 1-H.P. must be 230 volts. In A.C. districts alternating current motors 2-H.P. and under must be 1-phase 115 volts or 230-volts
The Edison Electric Illuminating Company of Peninsular Electric Light Co. Detroit, Mich.	Service wires should be carried out of building in service pipe with drip loop on outside wall. Service information must be secured from Co. before starting work. Co. brings service to building line all of the building.	Wires through the wall, service pipe (if required) and all wiring within the premises to be done by contractor. Company furnishes main switch and cut-outs. Patrol-man makes such repairs on customer's premises as do not require the furnishing of materials, except stock fuses. See SPECIAL RULES for switchboard rules.	Natl. Electrical Code rules must be followed. Inspection by Public Lighting Commissioner before comm. can be supplied.	The Company has the right to object concerning two and three wire connections	Plans for large installations must be submitted to the Company.	Direct Current motors of 2-horsepower or less and 1-phase alternating current motors of less than ½ horsepower may be connected at lighting voltage. Resistance starting box is required for motors of ½ horsepower or over on direct current; and on A.C. 1-phase of 2-horsepower and upwards.
Yakima Pacific Power Co. Washington D.C.	When mains are in the street the Company runs service to curb line. Consumer to run from there and furnishes conduit and it is installed by them at customer's expense. Cables in conduits are furnished and installed without charge. See next column.	In new buildings the Company furnishes length of Terra Cotta conduit to be built in wall. The Company may connect to poles from one overhead service per each 25 feet of frontage of each house. Co. installs service pull-box. Then service is overhead and customer desires U.G., the customer pays full cost. Standpipes for overhead service must be installed by contractor. Meters to be grouped and meter boards to be supplied by the Company. Approval of switchboards must be secured from the Company.	Work must be approved by the Electrical Dept of the District of Columbia and by the Company before connection is made.	16 lights with aggregate rating not exceeding 660 watts or any other device not exceeding this capacity may be connected to 2-wire circuit.	Work should not be started until information regarding character of service and location of meters is secured.	Moving Picture Arcs over 2500 watts must be 220 volts. Motors over 5-H.P. should be 220 volts. No-voltage release and starter required on all direct current motors over ½ H.P. Full information in writing should be secured before any motors or other equipments are purchased or installed.
Public Service Electric Co. Newark, N.J.	O.K. customers to furnish standpipe and wires. Customer, desiring the overhead service in the territory must run their own wire from pole to building to cellar.	Then service is to enter U.G. the contractor must furnish main switch and cut-out in cellar or basement. Then service is overhead and customer desires U.G., the customer pays full cost. Standpipes for overhead service must be installed by contractor. Meters to be grouped and meter boards to be supplied by the Company. Approval of switchboards must be secured from the Company.	Company reserves right to refuse service if work does not comply with rules of N. B. of F. U.	2-wire mains supply over 1200 watts or over 32 sockets.	Special permission must be secured to install motors over 5-H.P.	K.W. machines installed where 230 V. service is available must be wired for 230 V. Motors up to and including 5-H.P. should not exceed 2½ times full load current when starting. Up to and including 10 H.P. shall not exceed 2½ times full load. No-voltage release required for motors.

FIG. 5—CHART SHOWING SERVICE RULES FOR TWELVE DIFFERENT COMPANIES OPERATING IN THE EAST AND MIDDLE WEST

Location of Meters

Most companies prefer that the meters be installed at a common point, but some allow the contractor to terminate lines at the most convenient point. A rule has been adopted recently by the Brooklyn company to the effect that in apartment houses and in office buildings all end-line cut-outs must be installed at one point in the basement and as near as practicable to the service entrance. When this is not possible two groups of end lines will be allowed, provided that the resulting gap is filled in by the contractor. The New York Edison Company restricts the location of meters to within 7 ft. from the floor and does not allow them to be set in bathrooms, bedrooms, closets or any rooms which are com-

monly locked or over any apparatus, such as gas stoves, which would prevent ready access to the meter.

The Edison Electric Illuminating Company of Boston requires that in apartment houses and office buildings meters must be grouped either in the basement or in suitable cabinets on each floor. No other location than the basement will be considered by the United Electric

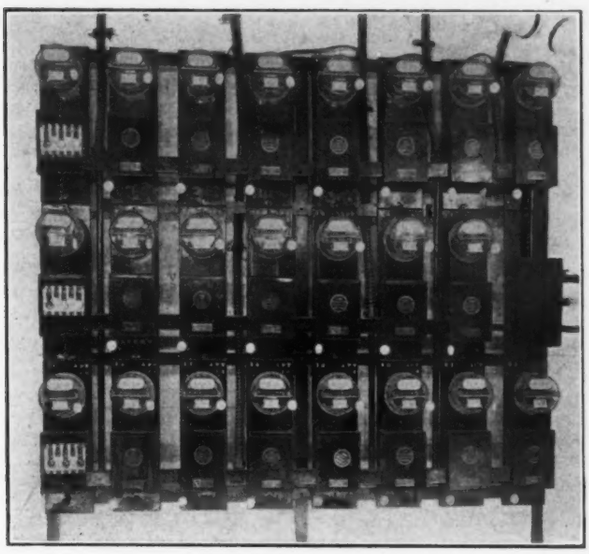


FIG. 6—ANGLE-IRON METER RACK INSTALLED BY BROOKLYN COMPANY

Light & Power Company of New York City. The Commonwealth Edison Company of Chicago stipulates that in office buildings meter loops should be installed at central points in meter closets or public corridors, while in apartment houses they should be in the basement.

Motors

To prevent line disturbances, all of the companies limit the starting current of alternating-current and direct-current motors, some stipulating that it be as low as one and one-half times the full rated current, while others allow three times the full-load current. The Philadelphia and Brooklyn companies have arranged to operate two-phase, 220-volt motors from four-wire systems, as it permits balancing of the phases and has other advantages, including fusing of the primary circuit. A number of companies require that both alternating-current and direct-current motors above 1.5 hp be wound for 230 volts. On the other hand, the Union Electric Light & Power Company of St. Louis, Mo., allows direct-current motors up to 1.5 hp to be operated on 110-volt energy, while the Philadelphia Electric Company allows alternating-current motors up to 1 hp to be operated at the same pressure.

Efficient Co-operation with Local Company Offices

A large central-station syndicate with nearly a score of local offices held a "get together" meeting at headquarters to devise means of improving co-operation throughout the organization. Among the topics discussed was local purchasing. The district office managers brought out the point that the standing of the organization in their territories had frequently been aided by the policy of patronizing local merchants in buying standard commodities, even though these might be in some cases more cheaply furnished by the purchasing department of the headquarters office. It was vigorously argued that in offices where all supplies were bought from the central bureau local business houses felt that the company ought to do something to support trade in its immediate neighborhood. In the discussion which followed the purchasing agent of the syndicate agreed that a moderate amount of local purchasing was no doubt a good thing, provided that the central department was, as a general rule, given an opportunity to get prices and forward these quotations to the local office. In many cases where this had been done the district office manager had secured a reduction in price from the local concern closely corresponding to the minimum quoted by the central purchasing bureau, with the result that the order was placed locally without loss of money, satisfying the local business houses and enabling the goods to be inspected before delivery.

Another point was the importance of sending rough drafts or proofs of blank forms to the district office coincidently with letters setting forth the details of their proposed use. It was found that these blanks were not only improved by criticism where this plan was followed, but the headquarters office was in a better position to purchase the required quantities from the printers where the local offices had full opportunity to pass judgment upon the forms before their make-up was finally determined. It was also brought out in the convention that the efficiency of the local offices all over the field could be increased by the inauguration and maintenance of a policy of sending to the home office the details of any labor-saving apparatus or methods locally adopted as a result of district office activities. From headquarters meritorious devices and methods are now to be passed on to other district offices, and an interchange of efficiency practice thus secured.

Eastern Time at Cleveland and Its Effect on the Central-Station Load

For a number of months the city of Cleveland has been observing Eastern standard time, having set its clocks forward one hour to gain the advantage of more natural light toward the end of the working day. The railroads entering Cleveland maintain the original schedule of Central standard time, and the neighboring communities in Ohio have not altered their clocks. As the result, travelers leaving Cleveland experience considerable confusion in catching trains, but Clevelanders find that on knocking off work in the evening an hour more of daylight remains than formerly, and most of the citizens appear well satisfied with the change.

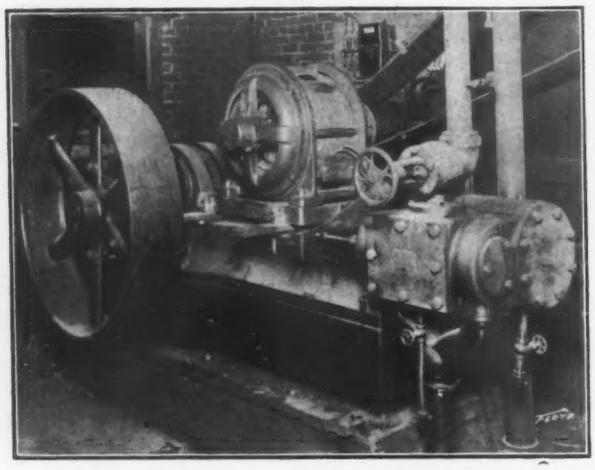
At the time the clocks were set forward there was considerable speculation on the effect the change might have on the load curve of the local lighting system. It was anticipated that while the evening peak load might be diminished, a corresponding increase would be noted in the consumption during the early-morning hours, and that this, taken with the improved load-factor, would offset the loss in the demand for lighting energy at nightfall.

Any accurate comparison of the load conditions under Eastern and Central time schedules is interfered with by a number of factors, including the general depression of business, the operation of factories on half time, the inauguration of municipal competition, etc. Eliminating these influences so far as possible, it is the opinion in the Cleveland Electric Illuminating Company's offices that, owing to the time change alone, the kilowatt-hour output of the company has been decreased by about 5 per cent, the evening peak has been lowered, the use of electricity in the morning hours has been increased, although not to the extent anticipated, and the load-factor of the system has been improved.

Merchandising Methods

Applying the "Show-Me" Policy in Motor-Service Sales

Several months ago the Arkansas Valley Railway, Light & Power Company of Pueblo, Col., submitted data to the Warner Fence Company of that city on the cost



35-HP MOTOR AND THE ENGINE IT REPLACED

of operating its factory, which was formerly steam-operated, by electricity. Careful tests had been made on the 40-hp engine, cards taken, the coal weighed, water measured, and the items of oil, waste and labor noted. The report furnished by the central station showed the possibility of a distinct saving in operating cost for the fence company, besides outlining the convenience, cleanliness and compactness of an electric-motor installation.

Mr. J. C. Bruce, operating manager of the fence company, examined the report with interest, but expressed some doubt whether the installation proposed would actually work out in practice, besides offering the objection that he did not care to make the investment at that time.

To prove the confidence of the central-station company in its own case, however, Mr. E. F. Stone, superintendent of lighting and power for the Arkansas Valley company, offered to furnish all the necessary wiring and the motor complete ready to run, for a period of three months, without any cost to the prospective customer, except for the energy consumed as shown by meter. It was further agreed that the work was to be done after factory working hours so that the plant's operation would not be interfered with. If at the end of the three months' trial period the fence company felt satisfied with electric drive, it agreed to purchase the outfit, motor and wiring at a figure already named. If the customer was not satisfied, the lighting company offered to remove the motor and installation without further cost to the manufacturer. As the installation was a trial one and it was desired to minimize expense, the permission of the manager was obtained to take the connecting rod and guides off the engine and to install the motor on top of the bedplate, as shown in the accompanying illustration.

After three months' experience with this 35-hp motor, Mr. Bruce found his doubts resolved and expressed himself as thoroughly pleased with the character of service and the cost of operation of his new electric installation, and he has become a booster for electric drive.

In commenting on the success of this installation, Mr. Stone, of the Arkansas Valley company, remarks: "When engineering data fail because the prospective customer is a manufacturer and not an engineer, I believe it good practice to treat him as a Missourian and 'show him.' In doing this, of course, the central station must be very conservative in its estimate."

Taking Customers Into Your Confidence and Into Your Home

During the spring and summer months Mr. W. A. Smith, vice-president of the Light & Development Company of St. Louis, wrote a series of successful circular letters to the company's electric-service customers recommending tried and proved household electrical appliances. The letters, with their paragraphs of human interest, demonstrated the usefulness of this type of central-station advertising and were reproduced in part in the ELECTRICAL WORLD of Aug. 15, 1914.

To follow these letters with more tangible proof of his sincerity and friendship, Mr. Smith recently mailed to each of the company's residence patrons a booklet showing the interior of his home with his own electrical appliances in use. The cover of the booklet depicts the front of the house and the inscription above it reads: "The Latch String Is Out." Beneath appears the signature which had been attached to each preceding letter, "Your friend, Bill Smith." Except for the titles under the photographs, the only printed matter in the pamphlet appears on the first page. It says:

"IN EXPLANATION:

"My letters to you stated that each article recommended had been first tried, found of real value, and then purchased and installed in my home.

"The object of this little booklet is to throw the home open to you that you may see the appliances in actual use.

"Because you are my friend it gives a me pleasure to do this.

"Losing sight of a natural objection to appear in public, through a desire to help and as hostess to welcome you, Mrs. Smith appears in the pictures actually

FIG. 1—THE SMITH FAMILY AT AN ELECTRICAL BREAKFAST

operating the appliances shown, all of which now form a part of our home.

" 'Tis but fair to pay her the tribute of saying that I attribute to her help and cheerful co-operation a large part of such success as has come to me. Your friend,

"BILL SMITH."

Following this page of explanatory comment were nine full-page pictures showing Mrs. Smith operating an electric washer, an iron, a range, a toaster, a percolator, a waffle iron, and a sewing machine. Then followed views showing the elder "Bill Smith, Jr.," a boy of twelve years, operating a vacuum cleaner; the younger Bill Smith, Jr., a few months old, "cooled off and put to sleep by an electric fan," and lastly "Bill Smith" himself, the day's work over, enjoying a pipe in the comfort of his den under the rays of a portable reading lamp.

FIG. 2—USING AN ELECTRIC RANGE WITH ENERGY AT 6 CENTS PER KW-HR.

Advertising for Electrical Contracting Work

The average electric contractor does very little advertising, or, if he does much, he is often at a loss as to the relative value of various mediums. The accompanying illustrations show some of the advertisements used with success by M. E. Arnold & Company, electrical contractors, Philadelphia, Pa. Newspaper advertisements are also employed, the size of which is naturally determined by the high cost of advertising in such mediums. Figs. 1 and 3 show reproductions of advertisements printed on back of postal cards. By keeping a list of former customers and prospective customers such advertising has been found to be very cheap and effective. Fig. 2 is a reproduction of a wall hanger which the firm sent to stores, offices, factories, etc., where the card would be seen by numerous persons. All the types of advertising illustrated have been found to pay. The firm does a general electrical repair and contracting business.

Electrical Work
OF EVERY DESCRIPTION
Motors
furnished, wired and installed complete for various uses, such as Printers' Machinery, Ventilating Fans, Pumps, Sewing Machines and all other power-driven machinery.
Electric Lighting
for Stores, Offices, Factories, Residences, etc.
Mazda Lamp Agents
We can suggest the best lighting arrangement to use, consistent with the least cost to install and the most economical to operate.
Private Telephone Systems
installed; from two stations up. Hundreds of our systems are in use in Philadelphia in residences and all kinds of business establishments. Every telephone is guaranteed perfect operation for two years.
"Push a button, talk and save a walk"
General Repairing
of all Kinds
M. E. ARNOLD & CO.
ELECTRICAL CONTRACTORS
114 NORTH 11TH ST., PHILADELPHIA
BELL FILBERT 5281
ESTABLISHED 1897
KEYSTONE RACE 144

FIG. 2—WALL-CARD TYPE OF ADVERTISEMENT

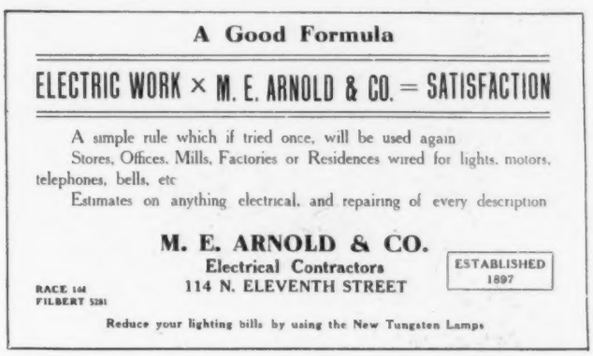

A Good Formula
ELECTRIC WORK × M. E. ARNOLD & CO. = SATISFACTION
A simple rule which if tried once, will be used again
Stores, Offices, Mills, Factories or Residences wired for lights, motors, telephones, bells, etc
Estimates on anything electrical, and repairing of every description
M. E. ARNOLD & CO.
Electrical Contractors
114 N. ELEVENTH STREET
ESTABLISHED 1897
RACE 144
FILBERT 5281
Reduce your lighting bills by using the New Tungsten Lamps

FIG. 1—POST-CARD ADVERTISEMENT

Even If You're NOT "From Missouri"
We will "Show" you how Electrical work can be done in the RIGHT way at the RIGHT price
M. E. ARNOLD & COMPANY
Electrical Contractors
Electric Lighting, Motors, Dynamos, Bells, Telephones, Fans, and every kind of Repair Work
TELEPHONES
Bell, Filbert 52-81
Keystone, Race 1-44
OFFICE STOCK ROOM SHOP
114 North Eleventh Street

FIG. 3—POST-CARD ADVERTISEMENT

"Winking" Exit Lamps in Motion-Picture Theater

Nearly all motion-picture houses are equipped with red exit lamps which burn continuously during the presentation of the films, but in most cases patrons become so accustomed to the steady glow of these lamps, or so interested in the performance, that the significance of the red-lighted "Exit" signs is lost. To remind his customers of the location of the carefully arranged exits in his new theater, an enterprising "movie" proprietor in Chicago has inserted thermostatic "winking" sockets in the exit signs, these sockets being adjusted to interrupt the lamp circuits, momentarily only, at intervals of thirty seconds.

Making Use of Contractors' Windows at Cleveland

Combining excellent publicity with helpful co-operation for local contractors, the Cleveland Electric Illuminating Company operates illuminated-sign displays

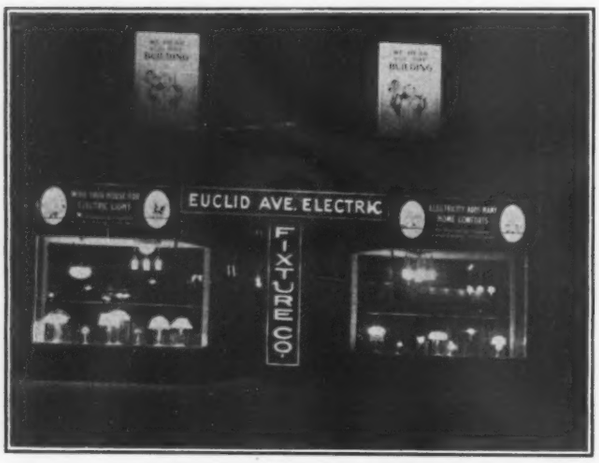


FIG. 1—CENTRAL-STATION SIGNS ON CLEVELAND DEALER'S STORE

in the store fronts and show windows of a number of electrical dealers and contractors. Two typical installations are illustrated herewith. Such locations are particularly logical for central-station signs, for

FIG. 2—ILLUMINATING COMPANY'S ADVERTISEMENT IN CONTRACTOR'S WINDOW

the prospective customer, once impressed with the idea of installing electricity in his home, looks about for a contractor to do the work. On the other hand, the rental received from the central-station company enables the dealer or contractor to maintain a higher standard of illumination in his store than he might otherwise be able to afford. In some instances the lamps installed to light the electric company's sign serve also to illuminate the dealer's window display.

Two-Wire Limit for Chicago Residence Installations Increased to 2640 Watts

In a circular letter just sent out to Chicago electrical contractors the Commonwealth Edison Company announces that hereafter all residence and apartment lighting installations which do not exceed 2640 watts or four circuits must have the service mains and meter loops wired two-wire, as such installations will be connected to the company's system by two service wires at 115 volts. The Commonwealth Edison Company will not hereafter connect such an installation three-wire, unless the connected load exceeds the above stated limits.

Business-lighting installations will be connected as heretofore; that is, all installations of over 1320 watts must be wired for three-wire service and three-wire meter loops. If such an installation totals less than 1320 watts, it should be wired with two-wire service mains.

How a New York Church Financed the Installation of Illuminated Crosses on the Steeple

On the steeple of a Presbyterian Church in the northern section of New York City are four illuminated crosses which have called forth much favorable comment from people in the vicinity. The crosses are illuminated each night at dusk and remain so the greater part of the night. They can be seen for considerable distances in every direction and call attention to the place of worship. While they were intended primarily to remind people of their religious duties, thereby in-

CHURCH WITH ILLUMINATED CROSSES

creasing the congregation and consequently the revenue of the church, their installation has been financed by persons wishing to pay a lasting tribute to the memory of relatives. Energy for lighting the lamps is supplied by the United Electric Light & Power Company.

Substantial Saving with Electric Vehicles

Complete Equipment and Modern Methods Enable Publishing Company to Effect Economies on Short Hauls

BY replacing horse-drawn vehicles used for hauling rolls of paper, waste paper, coal, mail and freight by electric trucks with demountable bodies and adopting efficient means of loading and unloading, the Curtis Publishing Company, Philadelphia, publisher of the *Ladies' Home Journal*, the *Saturday Evening Post* and the *Country Gentleman*, effected during the year 1914 a saving of $12,648, or 13.6 cents per ton, the total tonnage for the year being 93,000. The costs include all overhead expenses, interest on investment at 6 per cent, and depreciation at 10 per cent, and have been compared with the rates previously obtained from teaming contractors.

Former Conditions

Prior to August, 1912, the hauling of paper to the company's plant at Independence Square from its warehouse at South Eleventh Street and Washington Avenue, the hauling of its periodicals to the Broad Street station of the Pennsylvania Railroad, to the post office on Market Street, and to wharves along the Delaware River, the removal of baled waste paper from the plant, and the hauling of coal to the plant, were done under contract by a local teamster. In order to place periodicals on sale simultaneously at all points throughout the country they must be shipped by certain trains and certain boats without failure. Although the horse-drawn vehicles were always able to maintain the mailing schedule, six horses sometimes being used on a two-horse truck in blizzard weather, certain members of the Curtis Publishing Company were of the opinion that the haulage bills could be reduced by the use of motor trucks operated by the company, and they were able to induce the directors to make extensive tests with different sizes and types of motor trucks in the hope of demonstrating that an expenditure of about $90,000 for trucks and a garage would prove a good investment. The electric truck proved to be the most economical. The maximum efficiency of the gasoline-driven types of truck could not be obtained owing to short hauls averaging about 1.1 miles in the most congested parts of the city.

Types of Trucks Employed

The four-motor, four-wheel-driven type of electric truck manufactured by the Commercial Truck Company of America, Philadelphia, was selected as being best adapted to the conditions. The first truck was of 7 tons haulage rating and was purchased in August, 1912. This purchase was followed first by a 0.5-ton two-wheel-driven truck for carrying money, and later by four-wheel-driven trucks for various purposes, until at the end of the summer of 1914 the final truck was purchased, resulting in the equipment shown in Table I. During the year 1914 the electric trucks handled the entire haulage for the plant with the exception of the coal hauling, which was performed by teams under an existing contract during the first part of the year.

Demountable Bodies

With the exception of the 0.5-ton and the 1-ton machine, all the trucks can be used with demountable bodies when desired. These bodies are of two types, one for handling periodicals, paper, etc., and the other for handling coal. The former type of demountable body (Figs. 4, 5 and 6) has been designed primarily for the 3.5-ton trucks, but it is capable of carrying 5-ton loads and can be used with the 5-ton trucks by dropping the body in the center of the truck platform.

The demountable coal bodies (Fig. 3) were designed for use with the 5-ton trucks, but can be employed on the 7-ton truck. The hauling of coal from the storage plant forming part of the warehouse to the main plant is done at night, thus keeping the trucks in almost continuous operation at times. The coal bodies, which were supplied by the Edward G. Budd Manufacturing Company, Philadelphia, are of the side-discharge type, with funnel-shaped bottoms. They are not entirely self-unloading because the height of side necessary to accomplish this is greater than the distance from the ground to the overhanging portion of the coal pockets from which the trucks are loaded. Four pins dropped through holes in lugs attached to the body frame and through

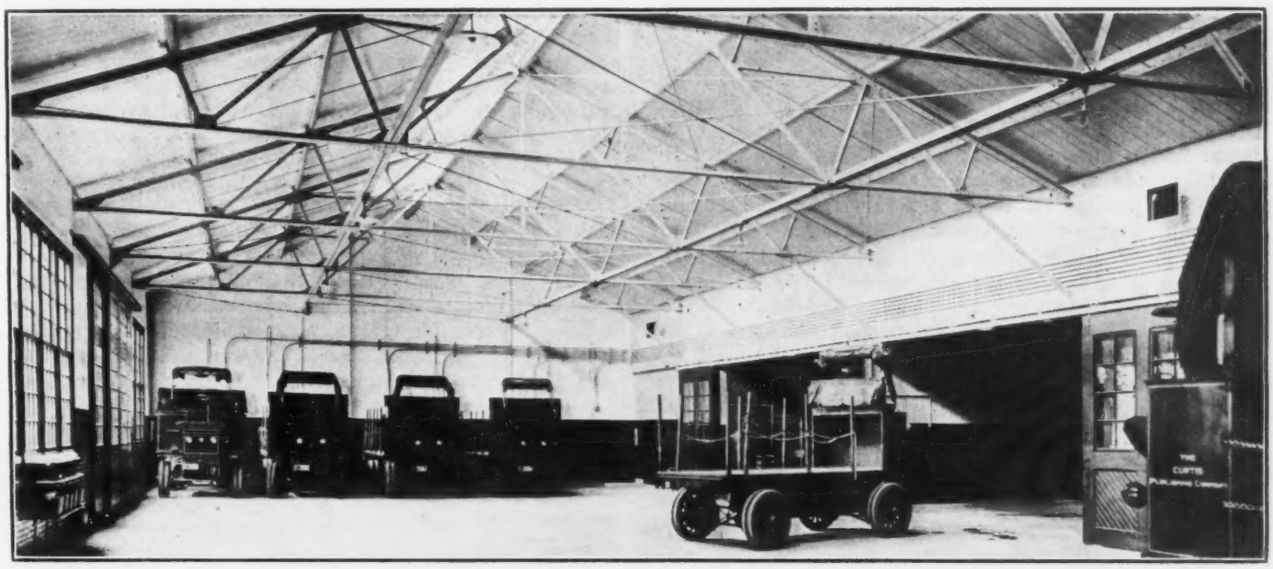


FIG. 1—INTERIOR VIEW OF GARAGE

registering holes in the platform serve to keep the body of a truck in place. The bodies are mounted on the trucks at the garage, where two differential chain-falls fitted with special arms for lifting the bodies are provided.

Warehouse Methods of Handling Materials

The warehouse of the company is a four-story building situated at Washington Avenue and South Eleventh Street. The rear side and one end of the ground floor are so built as to house spur tracks from the Pennsylvania Railroad. The rolls of paper are removed from the freight cars, the floors of which are level with the warehouse platform, by means of a 1-ton differential chain-fall mounted on a traveling I-beam running on I-beam tracks hung from the second-floor girders. By mounting the traveling beam on two small carriages which are pivoted on two other carriages that run on the lower flanges of the fixed beams, the traveling beam can be moved parallel with or at any angle to the tracks, thus permitting the beam to be inserted into the box cars regardless of their position.

TABLE I—ELECTRIC VEHICLE EQUIPMENT

Number of Trucks	Rating in Tons	Load Carried to Plant	Load Carried from Plant
1	7*	Paper from warehouse 1.1 miles distant.	Baled waste paper.
1	¼	Money from bank. First-class mail.	Money to bank. First-class mail.
5	5 *	Paper from warehouse. Five-ton trucks also haul coal at night from warehouse.	Periodicals to post-office, wharves and railroad.
4	3½ *		
1	1	Picks up ink, paste, etc., also empty freight bags from freight yards.	Small freight, etc.

*The 3.5-ton trucks handle all paper until its amount exceeds their rating, when the 5-ton and later the 7-ton trucks are also employed. The periodical load is heaviest during the interval from the tenth to the twentieth of any month. To balance the truck service during the intervening periods more paper than is required for immediate use is carried to the plant and stored for use during periods of maximum periodical load.

After the traveling beam has been inserted in a box car, two men insert the ends of a U-shaped frame attached to the chain-fall on a beam inserted into the end of the hollow steel core around which the paper is rolled. The crane removes the roll of paper and lowers it into a small four-wheeled truck by means of which the rolls are taken to storage spaces on the upper three floors of the warehouse to await their turn to be transferred to the plant.

A loading bay 20 ft. in depth is provided at the warehouse, the rear of the bay being 20 ft. to the rear of the building line, thus causing the upper three floors of the building to cover the bay and protect it from rain and snow. The trucks are backed against a platform and are loaded by means of a number of differential chain-falls which run on I-beams attached to the under sides of the second-floor girders.

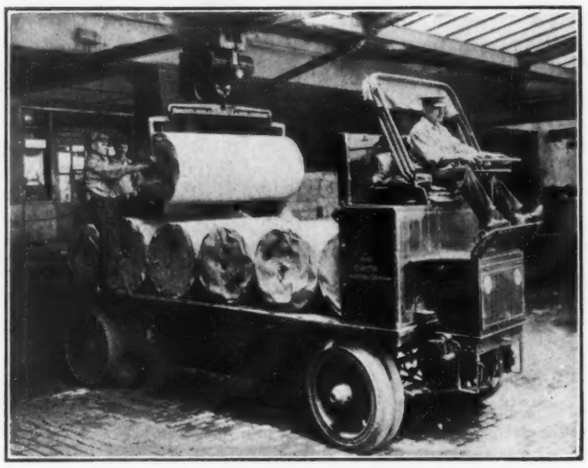


FIG. 2—UNLOADING ROLLS OF PAPER

Conditions at Plant

At the plant there is provided an inner court equipped with a glass-canopied platform along two sides for the reception of rolls of paper and the shipping of waste paper. Some mail is handled from the court and the remainder from a bay on the Sansom Street side of the building. Here electric hoists mounted on carriages operating on I-beams, placed at right angles to the edge of the platform and projecting beyond it, are employed for handling paper (Fig. 2).

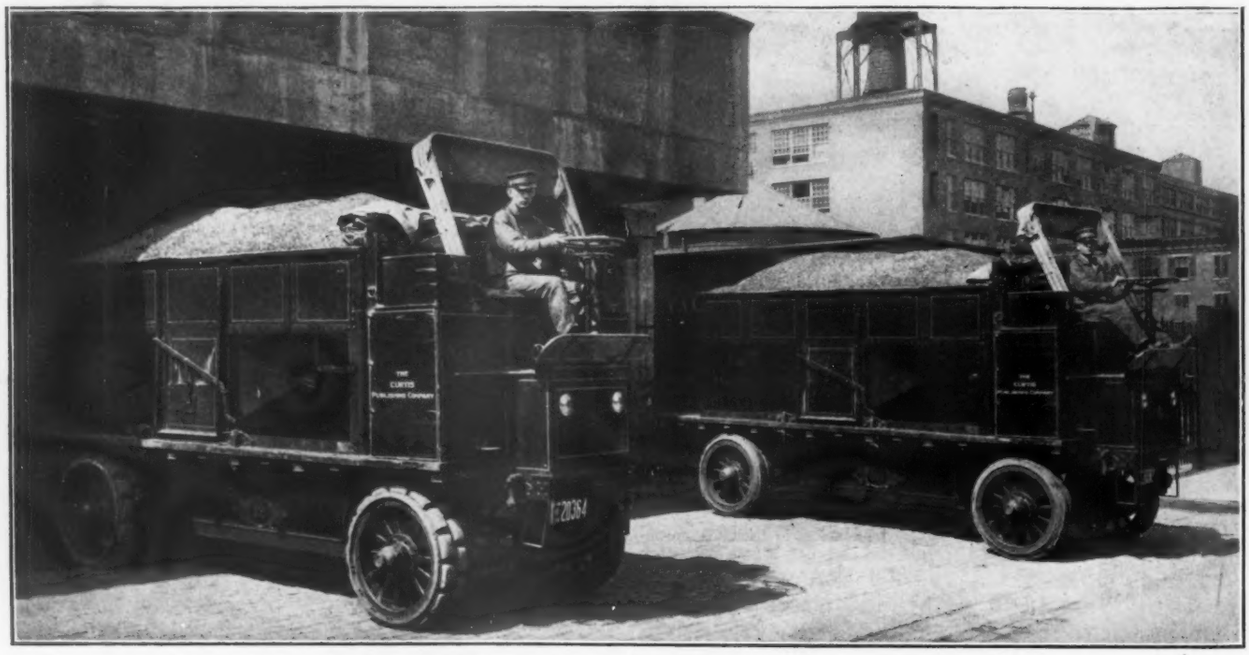


FIG. 3—DEMOUNTABLE COAL BODIES INSTALLED ON TRUCKS

The rolls of paper are picked up by a balanced horizontal arm with which the hoist is equipped, the ends of the arm being bent downward so as to fit into the ends of the hollow steel core around which the paper is rolled.

Upon being removed from the truck the rolls of paper

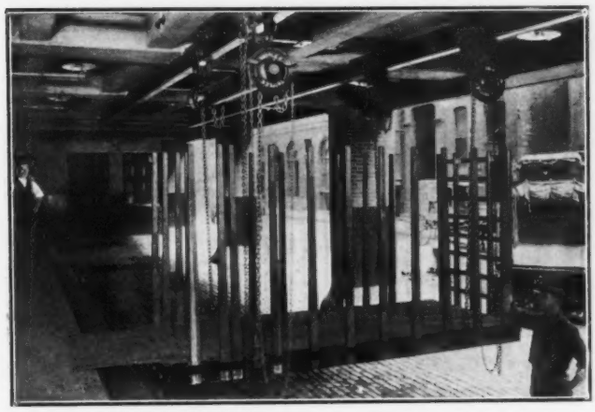


FIG. 4—DEMOUNTABLE BODY READY FOR LOADING

are not deposited on the unloading platform, but are lowered to the basement storeroom through a hatch directly under the hoist's I-beam. The driver and one man can unload or load the average paper truck in a minimum time of ten minutes. As a result the combined loading time at the warehouse and the unloading time at the plant is only about 20 per cent of the total time of a round trip, which averages about fifty minutes.

Baled waste paper is carried by the trucks on their return trip. This paper is hoisted from the baling machine in the basement to the loading platform by means of an electric elevator.

Application of Demountable Bodies

The accompanying illustrations show the construction and methods of handling demountable bodies. These bodies are lifted at the plant by means of triplex hoists, which move parallel to the platform and also permit of a vertical movement. The bodies are loaded while suspended by means of hand trucks, which in turn receive

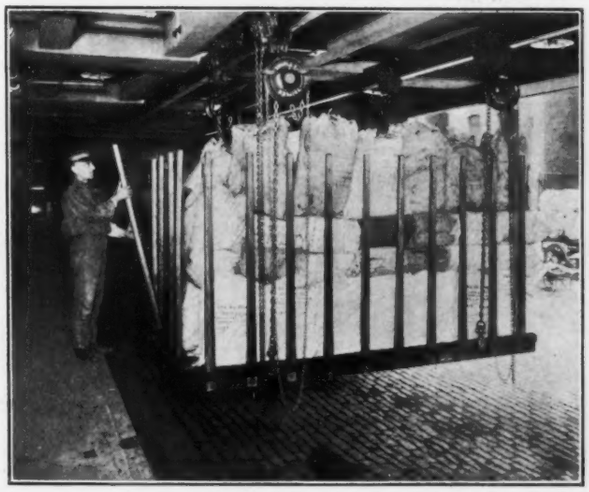


FIG. 5—DEMOUNTABLE BODY READY FOR TRUCK

their supply of periodicals from an elaborate system of conveyors. A short steel plate is used to bridge the distance between the edge of the platform and the edge of a body while loading. The bodies are placed on the trucks by simply lowering them and detaching the hoisting chains. They are removed in the reverse manner. In this way the loading time of a 3.5-ton truck has been reduced from eighteen minutes to about three minutes.

At present the demountable body offers no advantage at the post office, wharves or railroad depots, as equipment to handle it has not been installed. Efforts are being made, however, to obtain the privilege of installing the necessary apparatus at the depot and wharves, and if the negotiations result in such an installation, the time of a round trip of a truck will be considerably reduced. The greatest delays, of course, occur at wharves, where the inefficient dock employees and the inefficient methods of handling freight, drays, etc., are responsible.

The negotiations with the railroad company are for the entire use of a portion of its platform sufficient for the unloading of three trucks at the same time and for the erection of two overhead cranes for the removal of demountable truck bodies. In this way it would be possible for a truck to have its body lifted and, during the unloading thereof, to proceed to another of the three positions to receive an empty body.

TABLE II—EXPENSES FOR THE YEAR 1914*

Maintenance of tires	$2,803.58
Maintenance of battery†	269.28
Repairs‡	3,404.88
Grease and oil	50.00
Energy at about 4 cents per kw	3,482.65
Depreciation (10 per cent for machinery)	5,820.12
Interest (6 per cent)	314.52
Drivers' wages	8,221.72
Supervision	2,410.00
Garaging and washing	3,940.32

*In comparing all of these figures it must be remembered that only two of the trucks have been in service longer than eighteen months. Overhead expenses are not given here, but are taken into account in computing the saving of 13.6 cents per ton.
†Five reserve batteries are included.
‡A general overhauling is included.

Garage

The garage is a one-story building approximately 78 ft. by 125 ft., constructed of brick with a steel roof. The entire front portion of the building to a depth of approximately 50 ft. from the front wall is utilized as garaging space for the trucks. The rear of the building is divided by brick and brick-and-wood partitions into rooms as follows: battery room, stock room, pit and

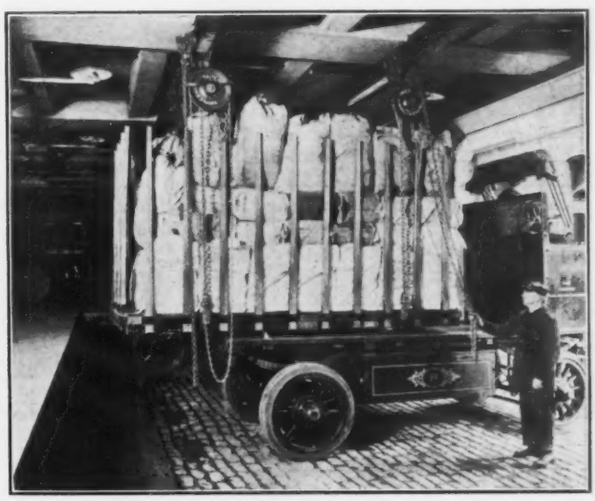


FIG. 6—TRUCK READY TO RECEIVE LOAD

repair room, truck-washing room, locker and toilet rooms, office, machinery room and boiler room.

The repair room is 24 ft. wide and is provided with two drained truck pits which when not in use are covered by plank tops.

The vehicle-washing room is of interest in that, in

addition to ceiling lamps, it is equipped with four special lighting units for illuminating the under portions of the trucks. One of these units is placed in each corner of the room. Each consists of a triangular box containing a 60-watt tungsten-filament lamp and a large reflector. The lamps and reflectors are protected from damage due to splashing water by means of circular pieces of glass forming part of the front faces of the triangular boxes.

The machinery room is equipped with a 75-kw motor-generator set and a four-panel switchboard with eighteen charging circuits. Fig. 8 is a reproduction from a photograph taken when only three panels were installed. A reverse-power relay is provided for opening the circuit-breakers in case the direct-current voltage should fall below that of the batteries being charged. The motor of the motor-generator set is wound for 125 volts, the voltage at the batteries being varied from about 110 volts to 120 volts during charging by means of rheostats in each charging circuit and by varying the generator voltage.

One panel of the switchboard is devoted to the control apparatus for the motor-generator. Each of the other three is made up of three horizontal sections, each of which controls two battery-charging circuits, thus giving a total of eighteen charging circuits. This type of board was adopted so that charging sections can easily be added as the fleet of trucks is increased.

A watt-hour meter is provided on the charging panels for each charging circuit. Each meter has two scales, one showing the amount of electric energy supplied to the truck during any desired period of time and the other showing the amount of energy supplied during a charge. In this way actual cost records of energy consumption can be maintained and the comparative efficiencies of the trucks determined. The vehicle operators are also required to keep data such as shown in Fig. 7, which is a record of the 7-ton truck during the period it was in the hands of one operator.

The building is steam-heated from a small boiler installed in it, the heating coils being 5 ft. above the floor level so as to prevent damage from the trucks. The battery-charging circuits are run in conduit near the tops of the walls, passing downward at outlets to a

THE CURTIS PUBLISHING CO. DAILY AUTO REPORT

TRUCK No. 3 DRIVER S. Jefferson DATE 4/15/15

WAITING TIME	MATERIAL HANDLED	QUANTITY	FROM	TO		LUBRICANT USED	MORNING READING ON ODOMETER	NIGHT READING ON ODOMETER	TOTAL MILES		Time
	Paper	Bundles 65 lbs	Warehouse	Plant	18		1268				7:30
	Waste		Plant	Warehouse	32						8:20
	Paper	Bundles 65 lbs	Warehouse	Plant	50						8:40
	Waste		Plant	Warehouse	65						9:25
	Paper	Bundles 64 lbs	Warehouse	Plant	80						10:00
	Waste		Plant	Warehouse	93						10:40
	Paper	Flat 2 tons	Warehouse	Plant	110						11:25
	Paper	Flat 2 tons	Warehouse	Plant	135						12:45
	Paper	Bundles 65 lbs	Warehouse	Plant	162						1:35
	Paper	Bundles 65 lbs	Warehouse	Plant	185						2:30
	Waste		Plant	Warehouse	200						3:10
	Paper	Bundles 65 lbs	Warehouse	Plant	215		1268	1290			3:45
Fleet	Paper	Bundles 65 lbs	Warehouse	Plant	240		5 miles	68 miles			4:30
				Garage							5:15

FIG. 7—A TYPICAL DRIVER'S RECORD

point about 6 ft. above the floor, where long cables are attached. When not in use, these cables are kept off the floor by throwing them over hooks fastened to ropes suspended from the roof trusses and weighted at the other ends sufficiently to overbalance the weights of the cables. The suspended charging cables have been protected from the danger of being struck by trucks by the erection on the floor at each end of the garage of wood bumpers approximately 2 ft. wide.

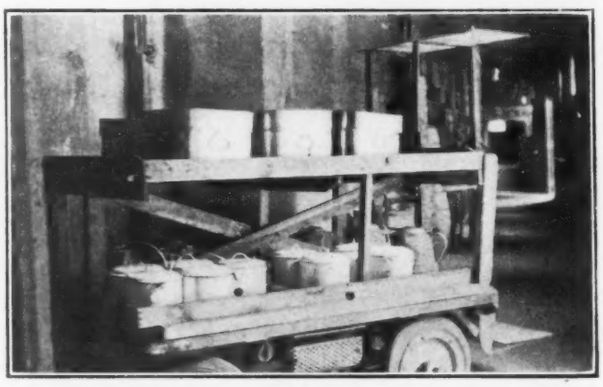
The trucks and batteries are examined daily, and there has never been an interruption in the service. Fifteen sets of batteries are maintained for use with the

FIG. 8—MOTOR-GENERATOR AND CONTROL BOARDS

ten larger trucks, thus affording opportunity for repairs, etc., without putting a truck out of service and permitting the substitution of another battery in case of long continuous service by a truck. Boosting service is also provided at the plant.

Industrial Truck Service in Hospital

A 1-ton industrial electric truck, moderate in price and economical in operation, is being employed in the new buildings of the Boston (Mass.) Children's Hospital to do the work formerly performed by four men. During its nine months of service not one dollar has been spent for repairs on this useful vehicle. The truck is used for the transportation of food from the kitchen to the elevators, for collecting and distributing washing, and for other odd jobs, and is operated in all about 20 miles per day. It is geared to run at 6 miles per hour and is equipped with a battery of forty-four cells, which are charged every other day with energy supplied from the central power plant of the Harvard Medical School. An automatic pedal on the truck



ELECTRIC-SERVICE TRUCK FOR CHILDREN'S HOSPITAL

cuts off the energy supply and applies the brake should the operator's foot be withdrawn from the machine. To avoid collisions with low pipes in the passageways traversed there is provided a horizontal screen above the operator's head as shown in the accompanying illustration. The platform of the machine, which is of the General Vehicle type, measures 3½ ft. by 5½ ft.

Interior Construction

ELECTRIC WIRING—I

Principles Covering All Installations—Provisions for Protection from Injury and Fire

BY GEORGE C. SHAAD

The general subject of electric wiring includes the power circuits in central stations, the design and construction of electric transmission lines and the layout of distribution systems, both overhead and underground, but in a more restricted sense it is considered to apply to the wiring of buildings, other than electrical power plants, for the supply of lighting and motor service and to include the distribution system from the service wires of the central-station company or the switchboard of the isolated plant to the lamps and motors. The design and construction of the transmission lines and the general distribution systems are beyond the scope of the present articles.

Electric wiring may be considered under two separate headings—the general principles covering all wiring installations, and the practice of wiring, which includes the multitude of special electrical fittings and devices which are on the market. The principles are few in number and can be treated somewhat in detail, but the variety of the devices in use is very extensive and no attempt will be made to cover such details of equipment

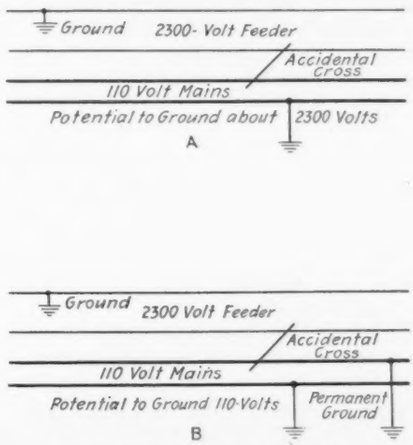


FIG. 1—GROUND DIAGRAMS

very completely. In the wiring of any building for lighting and motor service, several things are to be kept in mind. The first and most important of these is the provision for safety, that is, the protection against fire or personal injury, after which may be considered such items as permanency, convenience in the control of electrical equipment, appearance, cost, etc. In some exceptional cases it would appear that the matter of a low first cost had received the prime consideration, but happily such installations are not now the rule.

The introduction of live wires into the ordinary building may become a fire risk, and hence the fire-insurance interests have paid especial attention to the details of electrical wiring. The consideration of this question by the insurance organizations and others interested primarily in electrical matters has resulted in the National Electrical Code, as prepared by the National Fire Protection Association,[1] published by the National Board of Fire Underwriters[2]; the issuing of a "List of Electrical Fittings," as approved by the Underwriters' Laboratories, Inc.,[3] and the passing of special laws or ordinances by many of the cities covering the matter of electrical construction and inspection. The committee having the revision of the National Electrical Code in charge has representation from the American Institute of Electrical Engineers, the National Electric Light Association, the American Electric Railway Association, the National Electrical Contractors' Association and the National Electrical Inspectors' Association, as well as from the various fire-insurance organizations. The list of electrical fittings is published every six months, and fittings not included in this list should be used only after special permission has been secured from the insurance authorities. New devices cannot secure any extensive market unless they are included in the "approved" list. The Underwriters' Laboratories make a nominal charge for the tests and inspection of new devices prior to their approval. Electrical contractors, then, must be thoroughly familiar with the National Electrical Code and know what fittings are "approved," and they should be familiar with the local laws or ordinances governing electrical work.

The National Electrical Code

The National Electrical Code is a set of rules or requirements governing the installation of electrical wires and appliances prepared from the point of view of minimum fire risk, and it is the standard authority in the United States and Canada. In England similar rules are issued by the Board of Trade. There are good books written with a view to interpreting the code and making its principles clearer to the contractor and electrician, but the code itself is fairly brief. It does not deal directly with the matter of protection from possible personal injury and it is not a manual of design. The chief incentive in the enforcement of the code is the desire on the part of all concerned to have wiring and appliances installed in a safe manner, and the code is universally accepted as the authority for what is safe.

Protection from Personal Injury

Low-potential systems installed in accordance with the National Electrical Code are not of themselves a source of danger to persons occupying the building and using the electrical devices as the insulation of the wiring and fittings is supposed to guard against electrical shock, but in many such installations there is the possibility of the accidental contact of some section of the low-tension system with a high-tension line, in which case the building installation may become a considerable risk. It is for this reason that the permanent grounding of some part of the low-tension wiring is strongly recommended, and such grounding, up to potentials of 250 volts, is allowed by the National Electrical Code, provided no energy flows over the ground wire under normal conditions. With one conductor grounded the other conductor of the two-wire system is always at full potential against the ground, and it is in all cases desirable that fixtures be so installed that they will not ordinarily be touched by persons in contact with the ground or with grounded pipes. Fixtures which are so placed should be especially insulated. Cellars and bathrooms are locations where this matter should have especial attention. Where the wiring installation is a high-voltage one protection against personal injury is secured by so installing the conductors as to make accidental contact with them impossible, and by the use of special insulation.

The protection secured against accidental injury from high voltage by the grounding of the low-tension wiring, provided such grounding is properly done, is not clear to everyone, and the diagrams of Fig. 1 are offered in explanation. In Fig. 1 a 2300-volt single-phase feeder

[1] The electrical committee of the National Fire Protection Association, 141 Milk Street, Boston, Mass.
[2] The National Board of Fire Underwriters, 137 William Street, New York City.
[3] The Underwriters' Laboratories, Inc., Chicago, Ill.

and a 110-volt set of mains are represented at *A*. There is no ground upon the low-tension system, but there is a ground upon one of the high-tension wires and a cross between the other wire and the low-tension system. A person in contact with the ground and either wire of the low-tension system is subject to a potential in the neighborhood of 2300 volts. In Fig. 1 one wire of the low-tension system is shown permanently grounded in *B*, and the maximum potential which can exist between any part of the low-tension wiring and the ground is 110 volts. With a low-resistance ground upon the high-tension feeder the accidental cross with the low-tension wiring will result in an interruption to service. It is not always necessary for the ground upon the high-tension line to exist to make a cross with the low-tension wiring dangerous, as the high-tension lines may be extensive enough to possess considerable capacity against the ground, and the current charging this condenser might prove fatal if passed through a person's body. The main objections to the grounding of low-tension wiring systems are these: A single accidental ground upon the conductor of opposite polarity interferes with the service; conductors of the opposite polarity are always at full potential to the ground; permanent grounds are inconvenient when testing, and they cause an additional expense in the installation.

Electricity in Boston "Tech" Building Construction

Central-station energy is playing an important part in the construction of the great educational "plant" of the Massachusetts Institute of Technology at Cambridge, Mass., which is being built by the Stone & Webster Engineering Corporation of Boston. Thirteen buildings are now being erected, and later the total will be increased to seventeen, all fronting on the Charles River Basin and occupying an incomparably fine location from the civic standpoint. The

FIG. 1—MOTOR-DRIVEN BENDING MACHINE

buildings extend 800 ft. along the basin and run back about 1200 ft. from the parkway bordering the water. In general, reinforced-concrete construction is employed, with limestone and brick facings. The total floor area is 730,000 sq. ft.

On the construction job, which is as carefully organized as would be an undertaking a thousand miles from the headquarters office, a 35-hp motor drives woodworking machinery in a temporary sawmill structure, including a buzz planer, four saw tables, two swing-saws, a band-saw, an emery stone and a boring machine. A local machine shop, containing two drill presses, a 16-in. lathe, a double emery wheel, two hack saws, a 1½-in. "Little Giant" bolt machine and a 2½-in. to 8-in. Curtis & Curtis pipe cutter, is equipped with a 15-hp motor. By feeding the pipe cutter with an overhead traveler consisting of block and falls running on a 4-in. by ½-in. wrought-iron rail, three men's services are saved in operating the machine.

A large amount of steel rod bending is necessary in the reinforcement work. Fig. 1 shows a "Star" bending machine belt-driven by a 10-hp motor, the machine being capable of bending seven small rods at once with

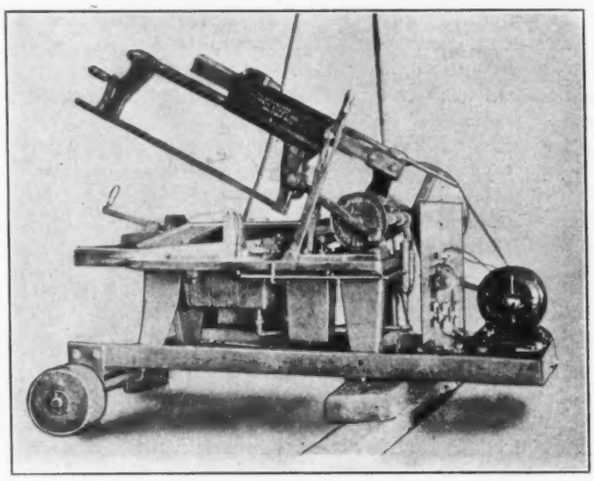


FIG. 2—PORTABLE MOTOR-DRIVEN HACK-SAW

close accuracy. Five 5-hp and two 10-hp motors are also in service driving pumps at various points on the property. Fig. 2 illustrates a portable hack-saw of home-made construction. It is belt-driven by a ½-hp, 110-volt motor and is provided with wheels 8 in. in diameter and with a face of 4 in., the wheels consisting of wooden blocks banded by strap iron. Stock 24 in. wide can be sawed in the machine, of which the portability and adaptability to service at any lamp socket have proved of great labor-saving value. The main frame is built of 3-in. by 3-in. by 5/16-in. angle irons, and the saw can be hauled about by one or two men with little difficulty.

In the forge shop on the field are two forges, each of which is equipped with a 12-in. Buffalo blower, directly

FIG. 3—CONDUIT BENDER

driven by a ½-hp motor. A 3-in. air pipe cares for the delivery in each case, and a slide valve placed below the forge bed affords close control of the draft at a level which does not interfere with the handling of stock between the forge and the anvil. About 50 miles of conduit are being installed in connection with the wiring for lighting, power, telephone, watchman's clock and

synchronized time systems to be used at the institute. A home-made conduit bender (Fig. 3) is effectively used. It consists in brief of two sheaves of different size between which the conduit is placed, the bending being effected by rotating a sliding dog about the center of the larger sheave and along the outer portion of the pipe as shown. The dog is mounted on a lever 5 ft. 6 in. long, the lever being 3 in. by ¾ in. in section. The larger sheave is 16 in. in diameter, and the smaller one 9 in. Both are mounted on a plate attached to the working table shown in the halftone, and the larger sheave is equipped with a groove of varying diameter to fit 1½ in., 1¼-in. and 1-in. conduit. The speed of bending is a notable feature of the equipment.

Electrical service during construction is supplied by the Cambridge Electric Light Company, the motors being of the 220-volt induction type and of General Electric and Western Electric manufacture. A transformer station is situated on the side of the grounds for local service. When the buildings are completed energy will be supplied from a plant to be erected by the institute and forming a part of its instruction equipment. The initial boiler installation will total 1800 hp. The estimated maximum load is 1000 kw, distributed mainly in alternating-current lighting and power circuits, with a small amount of direct current for laboratory service. In addition to utilizing existing generating apparatus, a new 750-kw turbo-generator set will be installed. Gas-filled incandescent lamps will be extensively employed, and in classrooms, study rooms and laboratories semi-indirect illumination will be widely applied. About 500 distribution panels will be required in the electrical circuits.

Electric Sewing Machines in Public Schools

Although many municipalities have installed electrical cooking devices in schools for the benefit of the scholars taking domestic-science courses, they have been loath to change from the old foot-driven sewing machines to the electric-motor-driven types. The movement in this direction, however, has received greater impetus by the recent decision of the Board of Education of Cincinnati, Ohio, to install electric sewing machines in rooms occupied by girls taking the public-school sewing course. Many girls who learned to use foot-power machines had much difficulty in accustoming themselves to motor-driven machines when they took positions in the factories. Manufacturers advised that the girls be given in their school training the experience that they will meet in factories, thus enabling them to become more efficient operators when they leave school than has been the case heretofore.

Electric Bus as Garage Advertisement

Mr. Harry Salvat, who has been operating an electric bus service from his garage at 740 East Fifty-first Street, Chicago, to the nearby elevated and suburban railway stations, recently made the statement that no possible profit could be made from this service at the 5-cent fare charged. The chief value of the bus, he declared, has been its effect as an advertisement in directing attention to his garage and in showing the public that comparatively heavy loads can be carried on battery-propelled vehicles. Many persons expressed surprise when they saw this reconstructed depot wagon pass with eight or ten persons aboard. The bus service is operated for the convenience of the customers of Mr. Salvat's garage, but other passengers are carried when there is room available.

Lighting Practice

Improved Street Lighting at Hot Springs, Ark.

Remarkable improvements have been made in the appearance of the main streets at Hot Springs, Ark., by replacing the old wooden poles with ornamental posts designed to support trolley span wires, distribution circuits, street lamps and circuits, railway feeders, and telephone and telegraph wires. The poles, which are 36 ft. 6 in. high, consist of three sections of telescoping rolled-steel tubing having diameters of 9 in., 8 in. and

FIG. 1—PORTION OF HOT SPRINGS "WHITE WAY"

7 in. respectively. The lower section, which passes through a square ornamental base bearing the monogram "H. S.," extends into a concrete footing.

About 13 ft. above the street level, attached to the top of the 9-in. section, is a four-arm ornamental bracket supporting 6.6-amp, 60-cp series tungsten lamps inclosed in 12-in. diffusing globes. At the extreme top of the

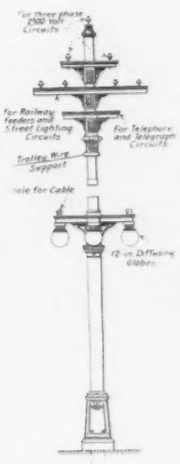

For Railway Feeders and Street Lighting Circuits
For Telephone and Telegraph Circuits
Trolley Wire Support
Hole for Cable

FIG. 2—ORNAMENTAL LAMP-POST SUPPORTING SEVERAL CIRCUITS

pole is a "sky-pin." Arranged below it in the following order are a two-pin cross-arm, a four-pin cross-arm and another two-pin cross-arm. The insulators on the "sky-pin" and upper cross-arm support three-phase 2300-volt distributing circuits. Railway feeders are supported on the pole pins on the four-pin arm, the other insulators being employed for street-lighting circuits. The lower cross-arm is for telephone and telegraph circuits. The poles are painted in two shades of green, the cross-arms being finished with aluminum.

About 150 of these poles have been installed, at a cost of approximately $22,000. Citizens owning property fronting on the streets benefited by the improved illumination have paid $50 per pole set. The contracts for this installation were let last September, and all work was completed in time for a general celebration two days before Christmas. A portion of the "white way" is shown in the accompanying illustration.

Details of the pole are represented in the line drawing. In the cross-arms near the insulators are slots through which cables can be run from the aerial circuits down to the lamp terminals. If city ordinances ever require the wires to be placed underground, the upper part of the pole can be removed without detracting from the appearance of the lamp-post. The equipment was installed by the Citizens' Gas & Electric Company, of which Mr. S. E. Dillon is general manager.

Status of Arc Lamp as Street Illuminant

As light for efficient street illumination should be directed below the horizontal plane through the light source, comparisons of street-lighting units could be made more satisfactorily if they were all rated in watts per candle-power measured at a certain angle below the horizontal plane. In speaking of "The Arc—Its Status as a Street Illuminant," before the Illuminating Engineering Society, New York Section, recently, Mr. C. A. B. Halverson, Jr., pointed out that a gas-filled lamp equipped for street-lighting is no simpler than an arc lamp and that the unit energy consumptions differ only slightly. If anything, the magnetite-arc lamp is more efficient than the gas-filled lamp. Moreover, as the inclosing globes of both types of lamps have to be cleaned periodically anyway, the time required for replacing carbon electrodes in arc lamps does not increase the unit expense considerably.

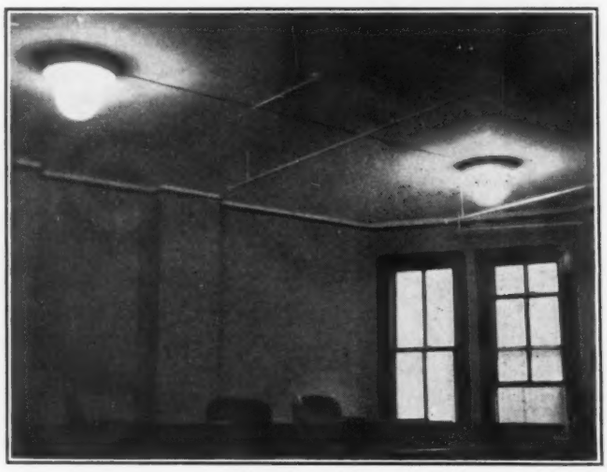
The speaker declared that records are available showing that arc lamps have been operated 350 hours per trim, while electrodes can be designed to last 700 or 800 hours. It was also stated that the mean spherical candle-power of magnetite-arc lamps does not decrease with usage as does that of incandescent units. Characteristics of inclosed, titanium and magnetite-arc lamps were described, their advantages outlined, and units of each type displayed. Some of these were equipped with refractors which direct the light flux 10 deg. below the horizontal plane. One of the refractors contained an etched unit which assists in diffusing the light. It was pointed out that by employing flattened electrodes shorter arcs and consequently lower voltages can be used without decreasing the dispersion of the flux. This method can be used to increase the number of lamps on a circuit without changing the station equipment or size of the conductors.

A discussion ensued in which the following took part: Messrs. C. F. Lacombe, A. H. Manwaring, C. H. Sharp, Ward Harrison, S. G. Rhodes, W. H. Rollinson, G. H. Stickney and J. B. Taylor. Mr. Lacombe expressed the opinion that although gas-filled lamps are suitable for some types of street lighting, arc lamps are required on boulevards. Mr. Manwaring said that flat electrodes are desirable for reducing shadows. Dr. Sharp recommended rating street fixtures on the watts per mean spherical candle-power as measured when equipped for the street.

Mr. Harrison believed that above 500 watts rating magnetite lamps gain rapidly in advantages over gas-filled units. He said that arc-equipment expenses may be classified as follows: Interest and depreciation, 18 per cent; fixed charges on central-station equipment, 30 per cent; maintenance, 24 per cent, and energy, 28 per cent. The advantage of incandescent-lamp equipment is the lower first cost, but renewals and maintenance form a large percentage of total operating expenses. The speaker expressed the belief that arc lamps have undergone as great improvements as incandescent lamps. He suggested placing series transformers on poles near street lamps rather than in the lamp holders to insure safety to maintenance men. Another member called attention to the tendency of small towns to improve their street lighting. As some electric-service companies are prevented by state law from making long-term contracts for street lighting, he suggested that they provide in their contracts for obsolescence and for the expense of replacing equipment.

Improved Lighting in a Hearing Room

The lighting of the hearing room of the Massachusetts Public Service Commission has recently been improved by the equipment illustrated in the accompanying halftone. The commission sits at a table 18 ft. long and 30½ in. wide, a 3-ft. by 12-ft. table for counsel being placed immediately in front of and 6 in. below the



LIGHTING FOR PUBLIC SERVICE COMMISSION HEARING ROOM

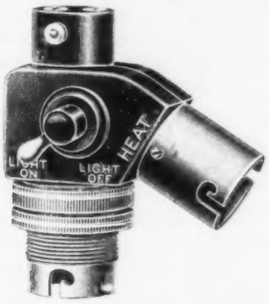
former. These tables were originally illuminated by six 50-watt graphitized-filament lamps installed in two fixtures, bringing the lamps 5 ft. above the board table, which is about 6 in. above that used by counsel. The lamps were equipped with small pear-shaped shades and gave inadequate illumination for the scrutiny of maps, drawings and documents. The room is 11 ft. high and has a whitewashed ceiling, walls finished in light green, and golden-oak furniture.

In place of the six 50-watt graphitized-filament lamps two 150-watt tungstens were mounted in white fluted parabolic inclosing bowls, 12 in. in diameter, 8 in. deep and suspended with the lamp centers 10 ft. 4 in. above the floor, the height above the table being 7 ft. Above each bowl is a white-enameled metal ceiling plate 18 in. in diameter, with a 2½-in. air space to carry away heat from the lamp. The fixtures are 13 ft. apart, both being controlled by a push switch on an adjacent wall. The improvement in illumination secured with the same energy expenditure cannot be estimated from the illustration, which was exposed to show the lighting units employed rather than their effect on the room itself. The diffusion is much better than it was before the change and the total flux of light has been increased materially notwithstanding the absorption of the new fixtures.

NEW APPARATUS AND APPLIANCES

Two-Way Plug

A two-way plug for bayonet sockets which has been developed by the General Electric Company, Ltd., 67 Queen Victoria Street, London, E. C., England, is shown herewith. The device has been designed particularly for use with heating appliances, and by means



TWO-WAY PLUG FOR HEATING APPLIANCE AND LAMP

of it a heating appliance and a lamp can be employed at the same time. The interior is arranged so that the heating circuit (at the side) is always alive, while the lighting switch is closed; but, by the turn switch provided, the lamp socket can be placed in the circuit or not. The plug can be locked into the socket by means of two small milled nuts.

Electric Oven for Baking Varnish on Steel Projectiles

One step in the manufacture of explosive steel projectiles consists of baking copal varnish on the interior of the steel missile. The baked varnish forms an enamel which prevents the guncotton or other explosive used from coming in contact with the steel and eliminates possibility of the explosive "sweating" through its container. Electric ovens have proved most successful, it is declared, for baking this varnish, and some of them are now being used in the Eastern steel mills of this country. One of the ovens made by the Despatch Manufacturing Company of Minneapolis, Minn., for a Pennsylvania concern is shown in the accompanying illustration. The projectiles for which this oven has been made are to be 5 in. in diameter, 15 in. long and weigh 34 lb. without the explosive charge. When varnished and

ELECTRIC OVEN USED FOR PREPARING EXPLOSIVE SHELLS

ready for baking ninety of the steel shells can be set in the portable racks, shown in the open door, and then placed in the oven. Electric heating elements rated at 3 kw are used to raise the temperature to 300 deg. Fahr. and at this temperature a single bake can be finished in six hours.

Portable Electric Air Heater

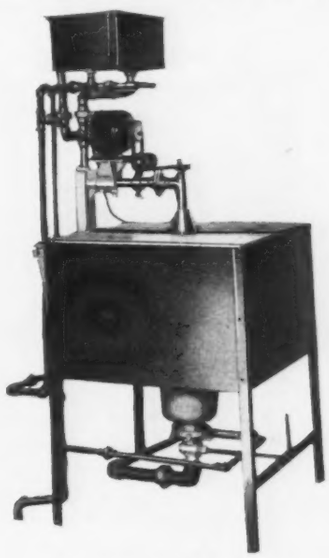
An electric heater recently placed on the market by the Lindstrom, Smith Company, Chicago, Ill., is equipped with a reflector which reflects the heat downward and is provided with a cord and detachable plug

ELECTRIC HEATER

so that it can be suspended from a bracket as shown in the accompanying illustration. The heater is 6 in. by 10 in. by 1.25 in. in size and weighs 2 lb. It is of pressed steel and is nickel-plated. The element it is declared, is non-corrosive and non-oxidizable. The heater is designed for circuits having pressures varying from 100 volts to 220 volts.

Motor-Driven Dishwasher with Stationary Tank

The electrically operated dishwasher shown herewith consists of a large stationary tank in which wire racks are so arranged that a separate compartment is provided for each dish, while a revolving cylinder with spray nozzles forces hot soapy water against the dishes with great force. The water drains over a screen to the sump at the lower end of the revolving cylinder,



ELECTRIC DISHWASHER

where a centrifugal pump again forces it up the cylinder and out of the spray nozzles against the dishes. This operation is continued from five to ten minutes, after which the motor is stopped and the water drained off. Hot rinsing water is passed through a different set of tubes attached to the cylinder, is forced against

the dishes, and is then drained off. The heat of the rinsing water is sufficient to dry the dishes rapidly. Water for this machine can be heated by either gas or electricity. Four gallons of water are required, two gallons for washing and two for rinsing. The "Nevernick" dishwasher, as it is called, is driven by a ⅛-hp motor and is being made by the Domestic Utilities Company, Newark, N. J.

Testing Contacts on Dry-Battery Carton

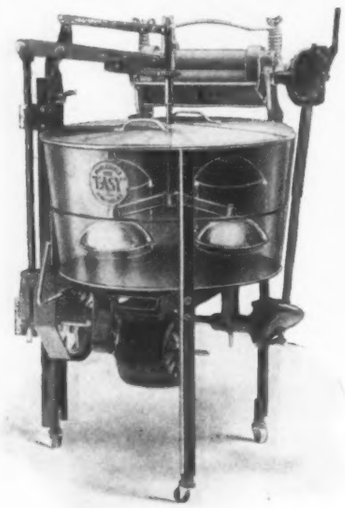
Brass testing contacts have been added to cartons containing dry batteries manufactured by the Bright Star Battery Company, 430 West Fourteenth Street,

DRY-BATTERY CARTON WITH TESTING CONTACTS

New York, as shown herewith. With these contacts it is not necessary to open a package or break the seal, and the testing operation is facilitated, it is declared.

Electric Washer with Vacuum Plungers

An improved electrically operated washing machine equipped with plunging "vacuum" tubs which can be tipped back out of the way after the washing is fin-



MOTOR-DRIVEN WASHER WITH PLUNGING CUPS

ished, thus giving free access to the inside of the tub, is shown in the accompanying illustration. The cover of the tub is made in two parts, and the plungers are supported from a lever which projects over the tub from side to center as shown. To remove the plungers a wing nut is loosened, the covers are lifted off, and the horizontal lever is turned back on its axis where it connects with the vertical drive rod. The machine is made entirely of metal. The tub is of solid copper and is tin-lined. The cover, the operating lever and its connections inside the tub are all galvanized. The plungers are of solid copper and move up and down sixty-three times a minute, revolving above the water on the up stroke. The air contained in the plungers on the down stroke forces the water through the meshes of the clothing, while on the up stroke the resulting partial vacuum causes the water to be drawn back through the fabric. The machine is designed to wash six sheets or the equivalent at one time. The inside diameter of the tup at the top is 23 in. and 20.5 in. at the bottom; the height is 12.75 in. The lever at the end of the wringer starts, stops and reverses the wringer. The washing machine is being made by Dodge & Zuill, Syracuse, N. Y., and is operated by a ⅛-hp motor built by the Robbins & Myers Company, Springfield, Ohio. The vertical bar which drives the wringer can be disconnected and dropped to a horizontal position for operating ice-cream freezers or other equipment of the kind.

Electric Cereal Sterilizer

Cereal manufacturers sterilize their products before marketing them, in order to stop the growth of any live organic material which may exist in the granular food. In some cereal establishments the sterilizing is done in electrically heated ovens, one type of which is being

ELECTRICALLY OPERATED CEREAL STERILIZER

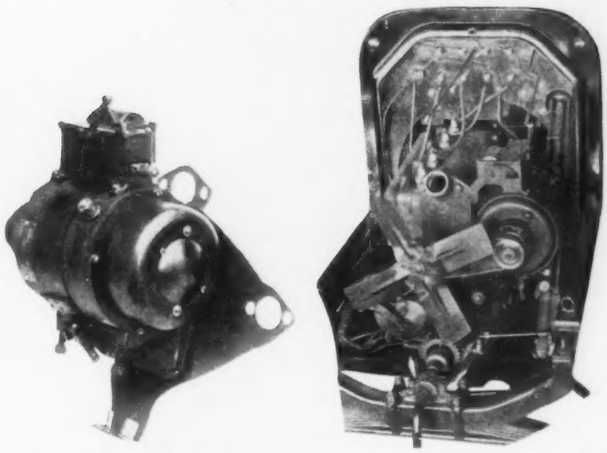
made by the Despatch Manufacturing Company of Minneapolis, Minn.

Inside of these ovens is a horizontal truncated cone-shaped cylinder of planished steel. The cylinder is driven by a small motor on the top of the oven through a belt and worm gear. Cereal is fed from the hopper on top of the oven into the cylinder while the latter is revolving, thoroughly mixing the product and bringing all particles into contact with the heated surface of the cylinder. When heated to the desired temperature the cereal is discharged through a hopper and a pipe at the lower end of the cylinder, and the product is then ready for packing.

With all heating units in operation a temperature of 500 deg. Fahr. can be attained in the oven, and by manipulating the three control switches any one of a wide range of lower temperatures can be secured. The maximum demand of the oven is 4 kw. By varying the temperatures the output of the sterilizer can be varied, the economical rates being 100 lb. per hour and 200 lb. per hour. In outside dimensions the oven measures 64 in. long by 28 in. high by 22 in. deep. It weighs approximately 600 lb.

Electric Starting and Lighting System for Automobiles

An electric starting and lighting outfit designed for model T Ford cars, of which over 600,000 are said to be in use, is being manufactured by the General Electric Company, Schenectady, N. Y., and is being marketed



FIGS. 1 AND 2—COMBINED MOTOR AND GENERATOR, AND METHOD OF INSTALLING UNIT

by A. J. Picard & Company, 1720 Broadway, New York. It consists of a combined generator and motor operating at 12 volts and a six-cell, 42-amp-hr. battery.

The combined motor and generating unit is fully inclosed and is 10 in. long and 7 in. in diameter; it weighs 52 lb. It is supported by a pressed-steel bracket which can be attached without drilling or tapping holes. Adjustment can be made for alignment of the socket gears and for tension of the driving chain.

As a motor the unit is designed to develop a torque of 45 ft.-lb.; when the car attains a speed of 11 miles

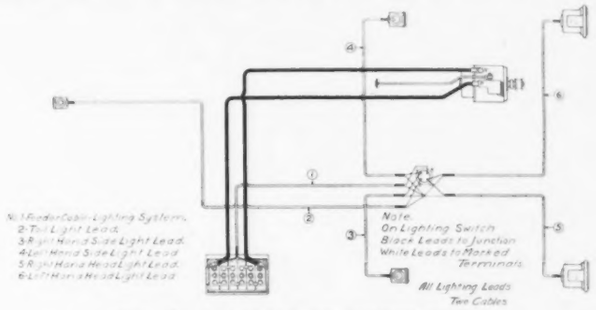
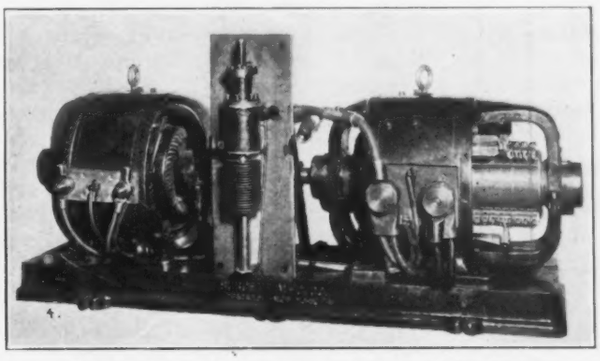


FIG. 3—DIAGRAM OF CONNECTIONS

an hour the unit acts as a generator and charges the battery. When the engine stops, the reverse-current relay automatically opens the battery circuit. The main switch and relay are mounted in an inclosed metal case on top of the unit and are readily accessible. The switch which controls the motor is closed through a cam actuated by a push-rod extending through the dashboard of the car and terminating in a knob conveniently placed near the steering-wheel column. The switch automatically opens when the push rod is released. The contacts are of the multiple-leaf type and the switch is provided with a mechanism that assures a quick break on opening.

Motor-Generator Set for Electrolytic Use

The motor-generator set shown herewith is designed for use with electrolytic cells for generating gas used in oxy-acetylene welding. Such a set of cells is operated most efficiently at 190 volts and 400 amp, whereas 230-volt direct-current energy is obtained from the central-station circuit. The motor of the set is de-

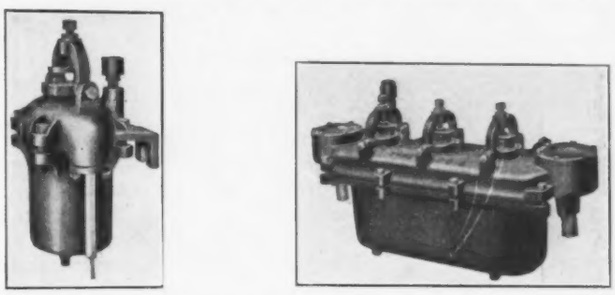


MOTOR-GENERATOR OUTFIT WITH REGULATOR

signed to take 400 amp and is placed in series with the gas-generating cells across the 230-volt mains. It operates therefore at 40 volts. The generator of the set operates at 230 volts and the energy generated is returned to the main. A regulator is employed which is designed to keep the current in the motor and cells constant at 400 amp. The set is rated at 13 kw. If an outfit consisting of a 230-volt motor and a 190-volt, 400-amp generator had been used its rating would have been 76 kw. The set was made by Roth Brothers & Company, Adams Street and Loomis Street, Chicago, Ill.

Subway-Type Oil-Fuse Cutouts

Oil-filled fuse cut-outs of the subway type designed for potentials as high as 2500 volts have recently been developed by the D & W Fuse Company, Providence, R. I. The single-pole cut-outs are made with ratings



FIGS. 1 AND 2—SINGLE-POLE AND THREE-POLE CUT-OUTS

of 50 amp, 100 amp and 200 amp, and the double-pole and triple-pole types with ratings of 50 amp and 100 amp. A single-pole cut-out is shown in Fig. 1 and a three-pole device in Fig. 2.

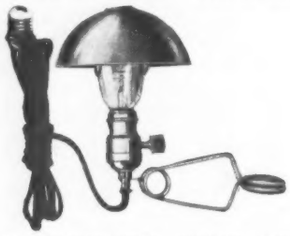
Use is made of a lead gasket which is compressed by a swiveling yoke. Another lead gasket is placed between the oil container and the top of the container.

This gasket is compressed by clamping bolts. Provision is made for connecting the cut-outs to a common vent pipe which is carried to the highest point within the manhole and from that point is dropped to within 5 in. or 6 in. of the floor, the lower end being enlarged a few inches. In case the manhole is flooded the air in the pipes is compressed as the water rises so that no water will reach the cut-out, it is declared, even if the manhole is completely filled.

The two-pole and three-pole cut-outs are equipped with a cable-connection compartment at each end for the use of two-wire or three-wire cable. In making connection with the cable in the manhole the individual conductors are each equipped with a special terminal. The cable is then passed through a bronze bushing and secured in position by means of a wiped joint to this bushing. Connection is made with the several conductors within the cut-out by a clamping screw, the individual conductors being separated by an insulating partition; the whole chamber is then filled with suitable insulating compound, which is poured in in a melted condition. The single-pole cut-outs are equipped with 2 ft. of lead cable to which wiped joints can be made in installing the cut-out. The fusible element is in oil and the cut-outs are so arranged that on the blowing of the fuse the oil is interposed between them, thus preventing the formation of an arc.

Lighting Fixture with Adjustable Clamp

An adjustable clamping device for use with incandescent lamps, by means of which the lamp can be attached to a bed, the back of a chair, the edge of a mirror, etc., is shown herewith. Use is made of a brass



LAMP WITH ADJUSTABLE SHADE AND CLAMP

shade equipped with spring clips which permit adjustment of the shade at any angle. The shade has a frosted aluminum finish on the inside and a brushed-brass finish on the outside. The outfit is provided with a plug and 8 ft. of cord and is being placed on the market by the Peerless Lighting Company, Peerless Building, Chicago, Ill.

Charging Receptacles and Plugs

Some of the charging plugs and receptacles developed by the Albert & J. M. Anderson Manufacturing Company, 289 A Street, Boston, Mass., for use in charging batteries on railway cars, are shown in the accompanying illustrations. The swivel charging receptacle shown in Fig. 1 is designated as a type C device and is rated at 100 amp. The device is designed for use on steam coaches, and the contact parts are molded into an insulating compound of great dielectric and mechanical strength so that there is no possibility of loosening. The cylindrical housing is provided with an iron guiding ring which supports the plug, thus taking all the strain away from the contact parts. The charging plug shown in Fig. 2 is also designated as a type C device and is designed for use with the receptacle shown in Fig. 1. The lugs are removable, and cables with diameters up to 0.5 in. can be used with the device. The lugs are attached with screws which permit of easy detachment when making soldered connection. The handle is equipped with a cable clamp for preventing abrasion of the cable. An insulating member is placed inside the handle both around the terminals and between them, so as to prevent grounding or short-circuiting. The weight of the device with iron handle and cable clamp is 3⅛ lb.

The receptacle shown in Fig. 3 is designed for switchboard charging and is rated at 65 amp. The metal cas-

FIG. 1—SWIVEL CHARGING PLUG

ing of this device is extended to form a support for the charging plugs so as to prevent the bending of the contact parts. The case is provided with two threaded collars, one on the front and the other on the rear, so that the receptacle may be installed on the panel either from the front or the rear. It is adapted for use on panels varying in thickness from 1 in. to 2 in. The hole

FIGS. 1 AND 2—CHARGING PLUG AND SWITCHBOARD RECEPTACLE

for mounting is 2 9-16 in. in diameter. The weight complete is 2.5 lb.

The charging receptacle illustrated in Fig. 4 is designed for mounting on an outlet box to which conduit connections can be made. The outlet box used with this device is 7 in. long, 7 in. wide and 6 in. deep and is provided with bosses on the four sides for conduits. The over-all height is 14.5 in. and the length is 10.25 in. The height of the receptacle without the outlet box is 9 in. The weight of the receptacle is 23 lb.

Receptacles of the type shown in Fig. 5 are designed for charging batteries on railway coaches when they are stored in the yards for repairing or cleaning. The

FIGS. 4 AND 5—YARD CHARGING RECEPTACLES

conductors are run in conduit which is threaded into the base of the receptacle case, thus making a watertight joint. The case is tapped for 1.5-in. iron conduit. The contact parts are protected when not in use by a spring lid which excludes dirt, moisture and snow. With the lid closed the length is 10 in. and the height is 12 in. The device is rated at 100 amp and weighs 23 lb.

Electric Hair Drier

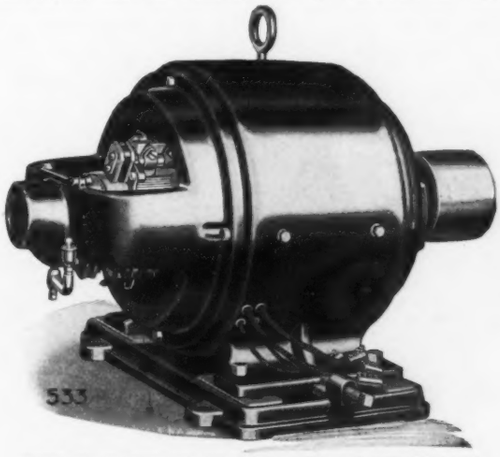
The electric hair drier shown herewith is of aluminum and weighs only 2 lb. The motor operates on either alternating current or direct current at 110 volts. The device is provided with a heating coil so that hot air can be furnished if desired. Use is made of a

ELECTRIC HAIR DRIER WITH HEATING COIL

three-point key switch. On turning the switch to the first point to the right only the motor is operated. A second turn puts the heating coil in the circuit and the machine provides a warm breeze. A third turn of the switch opens the circuit. The hair drier is finished in black enamel and is being placed on the market by the Shelton Electric Company, 30 West Forty-second Street, New York.

Small Direct-Current Motor

A direct-current motor which is designated as a type C machine and which is being built in sizes with ratings of ⅛ hp to 3 hp has just been developed by the Robbins & Myers Company, Springfield, Ohio. A squat cast-iron frame is employed, adapting the motor for installation where space is restricted. The bearing bracket at the commutator end extends well out from the frame and gives easy access to the commutator and brushes. The bearings are lubricated with oil rings and the oil reservoirs are equipped with overflow and drain plugs. The motor is of open construction or is fully inclosed and is horizontal or vertical as desired.

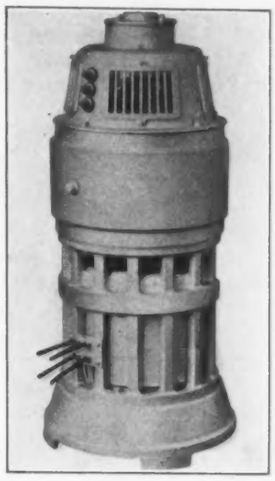


DIRECT-CURRENT MOTOR WITH LOW FRAME

It is also designed for either constant speed or variable speed, and may be shunt, series or compound wound. The motor is being made for 155-volt, 230-volt and 550-volt circuits, and also for service on low-voltage storage-battery circuits. The motor is provided with a sliding base, no-voltage-release starter, and a cast-iron crown pulley.

Vertical Automobile Charging Outfit

A charging unit of the vertical type for electric vehicles, which has been developed by the Hertner Electric & Manufacturing Company, Cleveland, Ohio, is shown in the accompanying illustration. It is equipped with ball bearings throughout and is designed to deliver at the

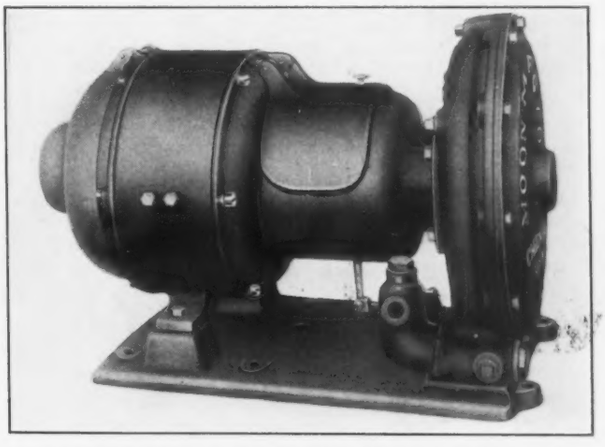


CHARGING OUTFIT FOR AUTOMOBILES

start energy to the battery at a high rate which gradually decreases as the battery becomes charged. According to the manufacturer, no harm can be done to the battery if the charging outfit is left on after the battery is charged. In case the circuit is broken, the unit will not stop but will continue to operate or float on the battery; as soon as the supply service is restored the outfit continues charging as before.

Small Portable Lighting Plant for the Contractor

A lighting plant said to be especially adapted to the needs of the contractor who works at night time is shown herewith and is being introduced to the contracting field by the Moon Manufacturing Company, Chicago, Ill. The outfit consists of a small portable



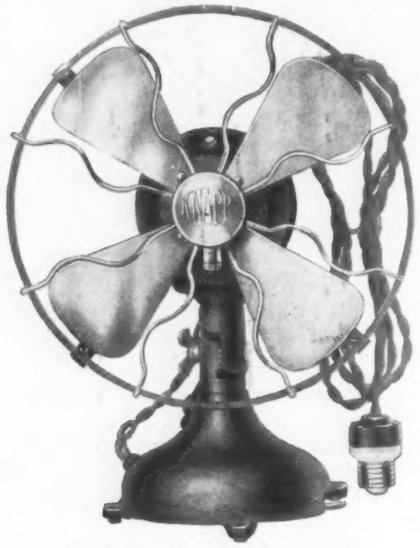
SMALL PORTABLE TURBINE-DRIVEN LIGHTING SET

steam-driven, impulse-type turbine, operating a generator at a speed of 2160 r.p.m. and at a steam pressure of 85 lb. to 200 lb. The cost of installation is said to be low, owing to the fact that no expensive switchboard or foundation for the turbine-generating set is required. Among the features claimed for the plant are compactness, portability, low cost of main-

tenance, few parts, friction reduced to a minimum, low steam consumption, simplicity of voltage and speed regulation, and small space requirements.

Ten-Inch Fan

A fan which is adjustable to any angle by means of a swivel and trunion is being placed on the market by the Knapp Electric & Novelty Company, 511 West Fifty-first Street, New York. The fan may be used as a wall



ADJUSTABLE TEN-INCH FAN

fan or as a desk fan as desired. It is provided with wick-feed oil cups and a two-speed starting switch. The motor is finished in black enamel, and the fan and guard are of polished brass. The motor operates at speeds of 1400 r.p.m. to 1800 r.p.m. and takes 20 watts. The shipping weight of the device is 18.5 lb.

Small Single-Phase Motors

Single-phase sixty-cycle motors with ratings of from 0.5 hp to 10 hp have recently been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The motors are compact,

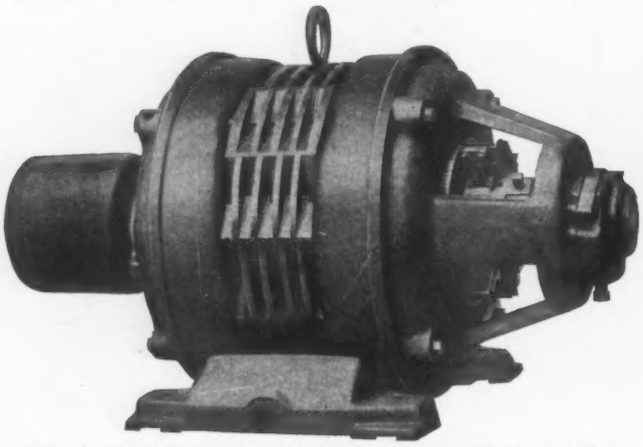


FIG. 1—SINGLE-PHASE MOTOR FOR INDUSTRIAL SERVICE

substantially built and light in weight. The machines, which are rated at 2 hp or over, are usually employed in industrial service and are of steel frameless construction. One of these motors is shown in Fig. 1. The smaller motors are provided with strong cast-iron frames as shown in Fig. 2. Both types of motors can be mounted on either the wall or ceiling, and may also be easily reversed in direction of rotation. They operate either on 110 volts or 220 volts. The motors start as repulsion machines, producing, it is declared, large torque with small starting current. A mechanically operated governor placed within the rotating element

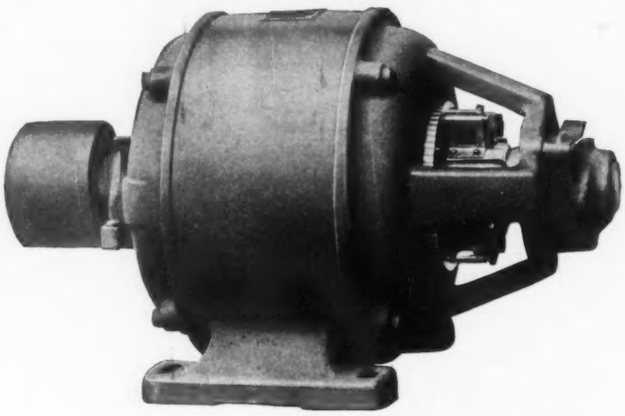


FIG. 2—SMALL SINGLE-PHASE MOTOR WITH CAST-IRON BASE

automatically changes the motor from a repulsion machine to an induction motor as it comes up to speed. Ordinarily, a double-pole line switch is the only starting device required, although starters may be employed to reduce the starting current further.

Three-Wheel Electric Tractor

The control handle of the electric tractor illustrated herewith is automatically locked when the operator leaves his seat. The tractor is equipped with a Westinghouse motor which is operated by a 250-amp-hr. battery placed directly over the rear wheel, thus providing the necessary weight for traction. The controller, also of Westinghouse make, provides four forward speeds and two reverse speeds. The front wheel is supported by a steel fork, is mounted on cup-and-cone ball bearings, and is turned by a hand lever. The frame of the machine is of channel iron which is riveted and welded. The wheels are of heavy semi-steel castings, the front

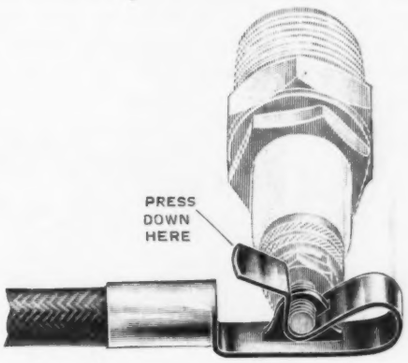
THREE-WHEEL ELECTRICALLY DRIVEN TRACTOR

wheel being 15 in. in diameter and the rear wheel 21 in. in diameter; they are equipped with 3.5-in. solid-rubber tires. The wheelbase of the tractor is 38 in., the over-all length 67 in., and the over-all width 38 in. The machine is provided with a turning radius of 33 in. and

weighs approximately 1900 lb. It operates at a speed of 8 miles per hour. The tractor is being made by the Mercury Manufacturing Company, 4110 South Halsted Street, Chicago, Ill.

Spark-Plug Connector

A spring connector for spark plugs recently developed by the Fahnestock Electric Company, 129 Patchen Avenue, Brooklyn, N. Y., is shown in the accompanying illustration. To install the device it is only necessary to press down the spring, slip the threaded stud of the plug through the hole of the connector and then let go the spring. The connector is beveled at the edge of the hole to fit the thread of the terminal.



CONNECTOR FOR SPARK PLUG

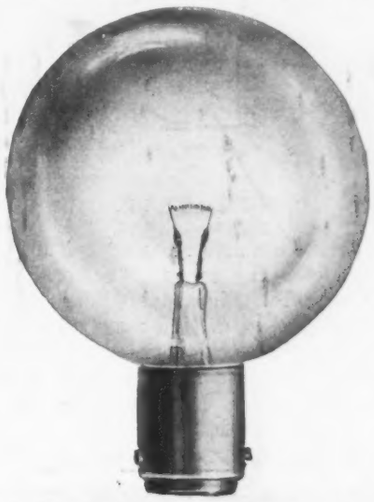
Electric Washing Machine

The electric washer of the wooden-tub type described in the ELECTRICAL WORLD of Oct. 10, 1914, page 731, has recently been improved. In its new form its mechanism is chiefly underneath the tub. The reversing mechanism is so designed that there is no quick jerk when the dolly reverses. The upright tube shown in the accompanying illustration contains the shaft which turns back and forth. The chain-and-gear drive on the top of the lid is completely inclosed. Foot-pedal control is provided for the operation of the wringer, and there are four pedals, two for forward driving and two for reversing. The dolly of the machine rests on the clothes instead of floating in the water. The washer is being made by the Meadows Manufacturing Company, Pontiac, Ill.

WASHER WITH MECHANISM CHIEFLY UNDER TUB

Nitrogen-Filled Lamps for Automobiles

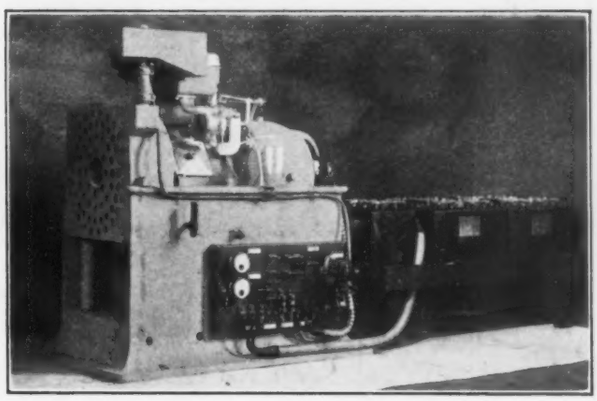
Nitrogen-filled lamps of the globular, tipless type have recently been developed by the Vosburgh Miniature Lamp Company, 291 Valley Road, West Orange, N. J. With these lamps a specific consumption of approximately 0.5 watt per cp is obtained. For head lamps the G-16½ type is made with ratings varying from 12 cp to 25 cp for circuits with pressures of from 6 volts to 21 volts, and in the G-12 type with ratings of 9 cp to 25 cp for pressures of from 6 volts to 21 volts. For side lamps they are being made in the G-10 type with ratings of 6 cp or 8 cp and for pressures of from 6 volts to 14 volts, and in the G-8 type with ratings of from 4 cp to 10 cp and for pressures of from 6 volts to 21 volts.



TIPLESS NITROGEN-FILLED AUTOMOBILE LAMP

Self-Contained Lighting Plant

Lighting outfits which consist of four-stroke-cycle gasoline engines directly connected to generators, the frames of which are combined in one casting, have recently been placed on the market by the Matthews Boat Company, Port Clinton, Ohio. The apparatus is built with ratings of 1 kw and 2 kw. The 1-kw set is operated by a one-cylinder engine and the 2-kw set by a two-cylinder engine. The 1-kw outfit is 3 ft. long, 23 in. wide and 3 ft. high, and is equipped with a battery which occupies a space 4 ft. by 1.5 ft. Both outfits operate at 32 volts. The sets are so designed that the engines carry the load most of the time, and the batteries discharge from full rating to 15 per cent full rating.



SELF-CONTAINED LIGHTING SET

Portable Current-Measuring Outfit

A portable current-measuring outfit designed for use on alternating-current circuits carrying from 75 amp to 250 amp is being made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The outfit consists of a portable split-type series transformer, a portable ammeter, a set of leads 10 ft. long and a leather carrying strap. The total weight of the outfit is about 30 lb. The transformer is so constructed that it can be clamped around a cable or feeder without opening the circuit. The transformer is provided with a clamp at one end and a hinge joint at the other so that the two halves can be opened, slipped over a cable and clamped together tightly.

CURRENT-MEASURING APPARATUS

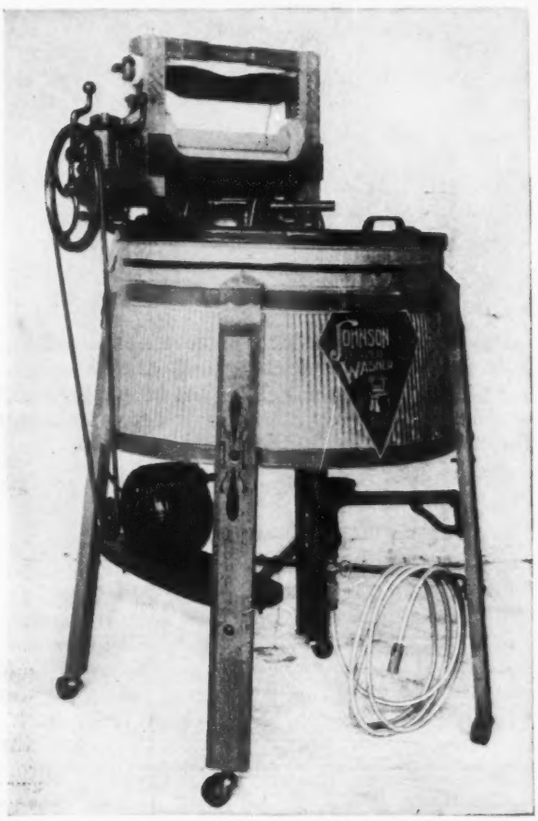
Small Electric Range

An electric range of compact dimensions recently developed by the Hughes Electric Heating Company, 211 West Schiller Street, Chicago, Ill., shown herewith, is designed particularly for teaching young people how to cook. The height of the range to the top of the shelf is 15 in., and the cooking surface is 11.25 in. by 8 in. The total weight is 7.5 lb. The oven is 4.5 in. wide, 2.25 in. high and 5 in. deep. It is provided with six heating units and takes 500 watts. The range is finished with black enamel and has a nickel-plated top, legs and oven-door front.

SMALL-SIZED ELECTRICALLY OPERATED RANGE

Electrically Operated Rotary Washing Machine

The rotary washer illustrated herewith stands high enough to enable it to be used alongside an ordinary stationary washtub, allowing the clothes to be passed directly from the washer through the wringer and into the rinsing water. The machine is provided with 6 ft. of hose through which hot water can be passed to the washer or dirty water can be drained from the machine. The outlet is in the center of the tub. The machine is also provided with a gas burner and 10 ft. of metal gas tubing for heating the water. The tub is of galvanized steel. The motor is designed to operate both the washer and wringer at the same time, and is so mounted that it can be easily disconnected and used for other purposes. The washer is being placed on the market by the Johnson Electric Washer Company, San Francisco, Cal., and is driven by a Westinghouse motor.



MOTOR-DRIVEN ROTARY WASHER

Automatic Lighting Switch for Automobiles

An automatic lighting switch which is said to give to the automobile wiring system the same protection afforded by the automatic circuit-breaker on ordinary lighting circuits has been brought out by the Hartman Electrical Manufacturing Company, Mansfield, Ohio. With this device fuses are unnecessary. It is opened and closed by means of a lever corresponding to the usual push-button. In closing the switch the lever is depressed and is retained in this position by means of a toggle lock. Should a ground or short-circuit occur,

an armature within the switch case acts on the lock and instantly opens the circuit.

As the majority of grounds or short-circuits which occur on the automobile are momentary, the manufacturers claim that a considerable saving in fuses can be obtained by using the device; also there is no temptation to close the circuit with a piece of wire after the fuse has blown in case no other fuse is available. With the

SINGLE-UNIT AUTOMATIC SWITCH WITH LEVER IN OPEN POSITION

automatic switch, whenever accidental troubles occur it is only necessary to close the switch. Should the trouble be due to a real ground, however, and an attempt be made to close the switch, it will instantly open again and the circuit cannot be re-established until the cause of the ground is removed.

Gangs of two, three and four units are being made by the above company with a single face plate, so that a separate switch can be installed on each circuit, thus enabling the operator of the car to identify the circuit on which the ground has occurred. In case it is desired to retain the usual lighting switch a single automatic switch connected to the battery wire ahead of the lighting switch or terminal block will give protection, it is declared, to all circuits. In such a case the switch is merely a protective device and comes into action only when a ground occurs.

Box for Wire Covered by Flexible Tubing

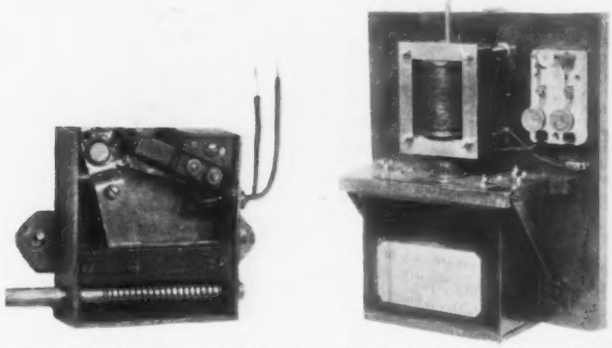
In the accompanying illustration is shown a box which is equipped with a fixture stud or collar and a saw-tooth grip to hold wire covered by flexible tubing. The box is so arranged that a plastered wall can be

BOX FOR TWO WIRES COVERED BY FLEXIBLE TUBING

finished flush with it. It is well adapted, the manufacturers claim, for wiring old houses, by cutting out a circle of plaster down to the lath and inserting the box. On the straight electric box a countersunk hole extends through the threaded stud, adapting the box for use with a toggle bolt or an ordinary wood screw. The "Meleady" box, as it is called, is made with two holes and four holes. The Sterling Foundry & Machine Company, Newark, N. J., is manufacturing the box.

Protective Device for Electric Elevators

An automatic elevator-door switch which is placed on the jamb of the cage at each door and which controls a master switch has been developed by the Black-Woods Manufacturing Company, 350 Knoxville Avenue, Peoria,

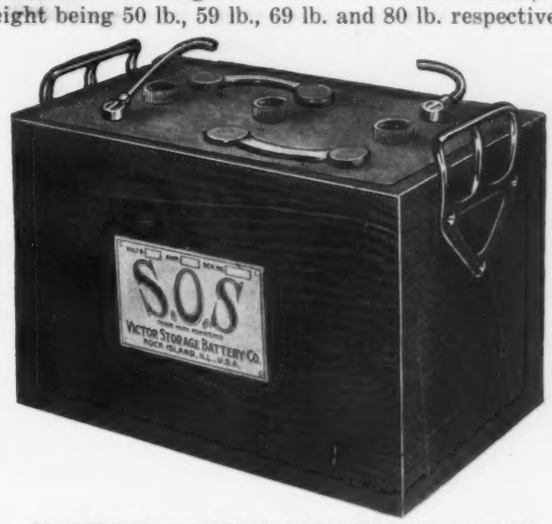


FIGS. 1 AND 2—AUTOMATIC DOOR SWITCH WITH COVER REMOVED, AND ELECTROMAGNETIC MASTER SWITCH

Ill. On each door there is an adjustable pusher which forces the plunger forward as the door is closed. The operation is so timed that the contact is made at the instant that the latch or door fastener is closed. The master switch is near the motor. Connections are so made that when a door is open the circuit is open. The automatic switches are placed on the ordinary 110-volt or 220-volt lighting circuit, instead of the motor circuit, which usually has a higher potential.

Battery for Starting and Lighting Gasoline Automobiles

The 6-volt battery shown herewith has recently been developed by the Victor Storage Battery Company, Rock Island, Ill., for lighting and starting gasoline automobiles. It is being made in four different sizes, the weight being 50 lb., 59 lb., 69 lb. and 80 lb. respectively.

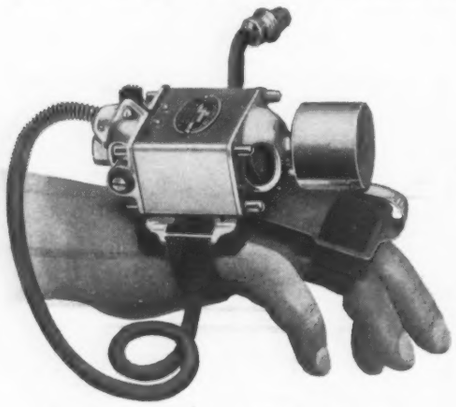


AUTOMOBILE STARTING AND LIGHTING BATTERY

The smallest type has a rating of 70 amp-hr. to 105 amp-hr., and the largest type of 160 amp-hr. to 195 amp-hr. According to the manufacturers, one of the features is the elimination of buckling and sulphation of the plates.

Hand Vibrator

A recent development of the Shelton Electric Company, 30 West Forty-second Street, New York, is a massage vibrator which weighs only 18 ounces and can

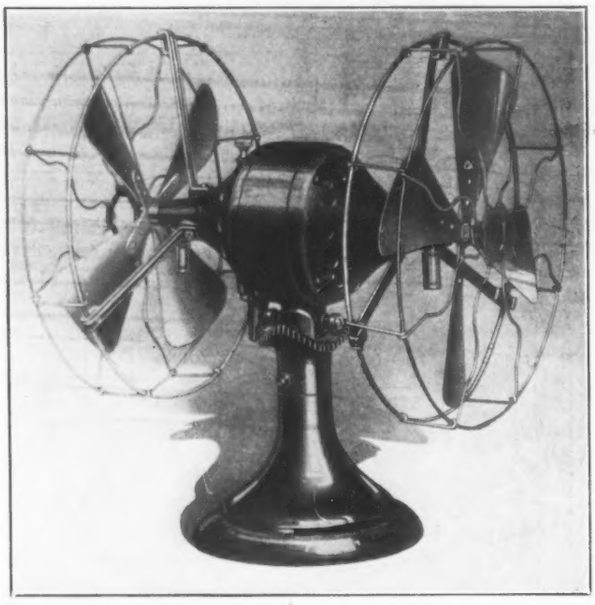


SMALL ELECTRIC VIBRATOR

be slipped over one hand as shown in the accompanying illustration. The motor is designed to operate on either alternating current or direct current at from 100 volts to 120 volts. A rheostat regulates the speed.

Fan with Vertical and Horizontal Oscillating Motions

By means of a worm gear engaging the circular rising and falling guide track shown, the fan illustrated herewith is made to tip forward and backward while rotating or oscillating about a vertical axis. Adjustment of a control screw enables the fan to be set for oscillation through any desired angle. The tipping motion can be disconnected if preferred, or the fan can be locked in a stationary position. The double-fan

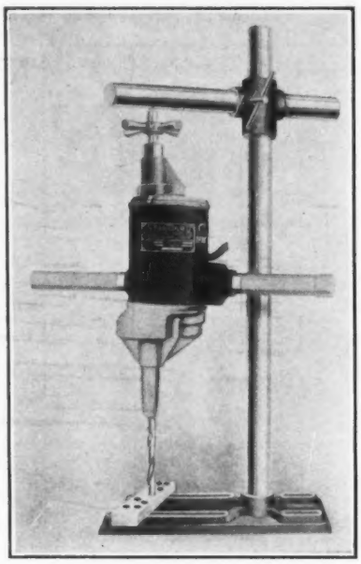


DOUBLE FAN WITH TWO OSCILLATING MOTIONS

type shown herewith is also arranged for mounting on a floor pedestal or column. The fans illustrated are manufactured under the name of "Storm Wave" by the Allied Electric Company, 105 North Clark Street, Chicago, and are available in 12-in. and 16-in. sizes, with three speed-control steps.

Stand for Portable Electric Drill

The drilling stand or "old man" shown herewith is being placed on the market by the Standard Electric Tool Company, Cincinnati, Ohio, for use with its port-



STAND FOR PORTABLE DRILL

able drill. The stand is made in two sizes, one being used for the 0.5-in., the 0.625-in. and the 0.75-in. drills and the other for the 0.875-in., 1-in. and 1.25-in. drills. The weight of the small stand is 50 lb. and that of the large stand 75 lb. The device is well adapted, the manufacturers claim, for use by structural-iron workers and for work requiring heavy drilling.

Workshop Lamp Standard

The lamp standard illustrated herewith is of substantial construction and is about 5 ft. high. The stem is of ash wood and fits securely into a cast-iron base. On

WOODEN LAMP STANDARD

the stem slides an adjustable collar of metal. A transverse wooden rod is provided which is attached by a metal clamp to the upright stem as shown. The lamp is attached to the transverse rod by a wooden clamp. The standard is being made by the General Electric Company, Ltd., 67 Queen Victoria Street, London, Eng.

CURRENT NEWS SECTION

Associated Manufacturers' Canvassing Committee

Mr. A. W. Berresford, general manager of the Cutler-Hammer Manufacturing Company of Milwaukee, Wis., has been appointed chairman of the canvassing committee of the Associated Manufacturers of Electrical Supplies. The members of this committee, as it is constituted at present, are as follows: Messrs. A. I. Appleton, Appleton Electric Company, Chicago; H. B. Betts, Thomas & Betts, New York; Charles L. Eidlitz, New York; William Handley, Tubular Woven Fabric Company, Pawtucket, R. I.; W. F. Hessel, Detroit Fuse & Manufacturing Company, New York; F. C. Hodkinson, Safety Armorite Conduit Company, Pittsburgh, Pa.; Harvey Hubbell, Harvey Hubbell, Inc., Bridgeport, Conn.; J. H. Parker, General Porcelain Company, Parkersburg, W. Va.; H. T. Paiste, H. T. Paiste Company, Philadelphia, Pa.; B. E. Salisbury, Pass & Seymour, Inc., Solvay, N. Y.; Herbert Sinclair, Star Porcelain Company, Trenton, N. J.; W. D. Steele, Benjamin Electrical Manufacturing Company, Chicago; Kurt R. Sternberg, Dickinson Manufacturing Company, Springfield, Mass.; Frank E. Watts, Hart Manufacturing Company, New York.

It is hoped to add members to the committee in the near future.

"Electrical Prosperity Week" Campaign

Further action on the plans for "Electrical Prosperity Week" was taken by the board of directors of the Society for Electrical Development on April 19. At a meeting held at the headquarters in New York the board approved unanimously the work of the general campaign committee to date and formally passed the special appropriation required. The sum of $50,000 was recommended by the general campaign committee as necessary for extraordinary expenditures. The budget for the coming year, to carry on the regular work of the society as conducted at present, was also approved.

It was announced that no effort would be made to have a special fund subscribed to aid in carrying on the campaign for "Electrical Prosperity Week." The expenditure, which it is estimated will aggregate considerably over $100,000, will be part of the subscription contributed by members of the society.

The board formally approved the date, Monday, Nov. 29, to Saturday, Dec. 4, 1915, inclusive. It will be a "shop early" campaign as well as a general sales and publicity effort. The general approval of the title, "Electrical Prosperity Week," led the board to accept this designation. The directors who attended the meeting were Messrs. Henry L. Doherty, Henry L. Doherty & Company; W. H. Johnson, vice-president Philadelphia Electric Company; A. W. Burchard, vice-president General Electric Company; Fred Bissell, managing director the Bissell Motor Company; Gerard Swope (represented by E. W. Rockafellow), Western Electric Company; F. S. Price, president Pettingell-Andrews Company, Boston; J. R. Strong, president Tucker Electric Construction Company, and Hugh M. Wilson, vice-president McGraw Publishing Company.

The names of those who will represent the campaign committee in the different geographical centers will be given out as soon as the lists are completed. Over thirty cities will be represented.

The fact that the newspapers and public have shown so much interest in the campaign received much comment at the meeting. Peoria, Ill., is the first city to offer co-operation in the movement. Through Mr. W. E. Wolgamott and the Peoria Electric Club this city notified the society that it was "out to boost 'Electrical Prosperity Week'" and asked for instructions. A committee was appointed consisting of Messrs. Frederick Simms, Avery Manufacturing Company; H. M. Bean, Peoria Railway Company, and W. E. Wolgamott, city electrician, to work with the leaders of the campaign in handling the affair in Peoria.

The staff of the society is being augmented by sales and publicity experts. The field co-operation section of the society has been enlarged by the engagement of Mr. George W. Hill, formerly of the Westinghouse Lamp Company. Mr. Hill's territory will include the Atlantic Coast States and part of the Middle West. He will handle the personal promotion work in this section.

Motor Control in Foundries and Steel Mills

The meeting of the American Institute of Electrical Engineers held at Pittsburgh, Pa., April 15 and 16, was one of a series for the study of motor applications by industries on which the industrial power committee of the Institute has been working this year. The principal divisions of the problem in each industry are (1) the form of drive, (2) the motor, and (3) the controller. At the Pittsburgh meeting the papers and discussions were confined to foundry and steel-mill subjects, power problems in these industries being considered with special reference to matters of control.

In his introductory address Mr. David B. Rushmore, chairman of the industrial power committee, divided the engineering work of the committee into four parts: Electric motors, controllers and auxiliary devices, conditions involved in motor application, and the application of electric motors to manufacturing processes. The committee desires its work to be of direct value to the operating and commercial organizations which look to the Institute for their engineering information. Mr. Rushmore suggested that in the future the committee present an annual report covering more thoroughly than can be done by papers and discussions the art of motor application, such reports to be of the nature of an engineering handbook on the subject and to furnish technical information which can be used as a foundation for developments in practical lines by power companies, manufacturers and engineers interested, besides its use as a textbook for educational institutions.

Mr. R. H. McLain opened the technical program with a paper entitled "Industrial Control in the Foundry," dealing briefly with types of control similar to those in other industries and treating more fully the theoretical side of crane control. For miscellaneous machines such as blowers, grinders, mixers, drivers, conveyors, etc., good substantial hand or automatic starters capable of starting the apparatus a few times a day are required. Safety of workmen and protection of the motors against

dirt necessitate inclosed types. For lifting magnets controllers are provided with a spring-return reverse point which gives, through preventive resistance, a partial reverse exciting current, so as to hasten the release of the load. Ordinary rheostatic controllers are nearly always suitable for cranes without very special precautions being taken to adapt them for foundry service for maximum hook speeds of 15 ft. per minute and less. For hook speeds above 15 ft. per minute it is sometimes necessary to adopt special arrangements. On direct current a convenient method is to use a shunting resistance across the armature for obtaining creeping speed. For alternating current it is necessary to provide a larger number of controller points and sufficient resistance to reduce the torque at starting to about 25 per cent of normal. The author expressed his belief that alternating-current service is acceptable for this work when used with a well-built crane, a good solenoid brake, and a good mechanical load brake under either of the following conditions: first, when not less than 25 per cent of maximum geared speed is required for delicate operations and when torque to break static friction does not exceed running torque by more than 33 per cent, and, second, when not less than 10 per cent of maximum geared speed is required for delicate operations and when the time used up in performing delicate operations does not occupy more than 5 per cent of the total time of the operator.

Discussion

In opening the discussion Mr. H. S. Newlin said that the magnetic switch can be used to advantage on every stationary unit of equipment. In his opinion, the lifting magnet has proved to be one of the most useful labor-saving devices about the foundry. Such installations will be of little value, however, if the proper controlling elements are not correctly designed and of liberal proportions to receive the "kick" of the induced voltage resulting from breaking the current.

Mr. T. E. Tynes said that experience has shown it to be wise to equip cranes with automatic control, from the standpoints of both safety and maintenance cost. With automatic braking low, creeping and high speeds can be secured with absolute protection from plugging and from the severe strains caused by careless operation.

Mr. Max Hartenheim called attention to the value of the Ward Leonard system of control in cases where cranes have to run under varying loads with very wide ranges of speeds, and where only alternating current is available.

Mr. Brent Wiley thought that more attention should be given to the control of the crane trolley, on which the brunt of the service falls.

Mr. James Farrington stated that the weak feature in automatic control lies in the possibility of the armature circuit opening up or the trolley line burning off, in which case the load would be dropped should the operator fail to act. This fault has been overcome, however, by using a series switch which is operated in series with the field circuit.

Mr. S. C. Coey said that his company has replaced its mechanical brake equipment with a divided power and dynamic braking hoist control, using two series brakes. In order to overcome the unsafe points of this control, the company is installing a double control circuit on the armature circuit of the hoist motor.

Mr. Francis J. Burd recommended putting a mechanical governor on the main hoist motor and arranging a contact on the governor in series with the shunt switch to break the line circuit, thus cutting energy off when setting the brake.

Mr. C. M. Bartlett described an electric resistance furnace having a heating chamber with a reducing atmosphere to reduce losses by oxidation and scaling.

Other papers presented at the meeting were as follows: "Mill Controllers," by Mr. H. F. Stratton; "Control Problems in the Steel Mill," by Mr. J. S. Riggs; "Control of Direct-Current Hoists in Iron and Steel Mills," by Messrs. G. E. Stoltz and W. O. Lunn; "Direct-Current Control for Hoisting Equipment in Industrial Plants," by Mr. W. T. Snyder; "Alternating-Current Controllers in Steel Mills," by Mr. Arthur Simon, and "The Alternating-Current Coal Hoist," by Mr. Raymond E. Brown. Owing to limitations of space in this issue, abstracts of these papers, with reports of the discussions, will be presented in a later number.

Effect of War on Berlin Railways

The effect of the European war was not felt on the Berlin surface railways until the autumn of 1914, but the annual report of the Grosse Berliner Strassenbahn for last year shows that losses in traffic on account of the war and of additional rapid transit and bus competition led to a reduction in dividends from 8 per cent in 1913 to 6 per cent in 1914. During mobilization there was a feverish increase in travel, but in August the loss as compared with 1913 was 13 per cent, and by December it had increased to 15 per cent. The mobilization of 50 per cent of the operating staff made it necessary to reduce service 25 per cent until the 5000 employees could be replaced. Service on certain parallel lines was reduced or eliminated, while on the active lines trailers were increased, headways were lengthened and schedule speed was raised.

During the first seven months of the year 12,735 people were employed, but during the last five war months the number fell to 9546.

At first the number of applicants for employment to fill the places vacated by the enlisted men was so large that the company thought there would be no difficulty in getting new men. This expectation was not fulfilled, however, because most of the unemployed were engaged by manufacturers of war material. Although about 600 female members of employees' families were trained for service as conductors, the difficulties were great because most of the instructors had been mobilized. On account of the increase in prices of foodstuffs and other necessities, the company raised wages pending settlement of the war. In the case of employees at the front who left dependents it is paying each wife $6.25 a month, with an additional $1.25 for every child less than fifteen years of age. A donation of 3¾ cents daily is made for what is termed "milk money." Women conductors with children also receive the $1.25 and 3¾ cents allowances. The positions of all men called to the front are being kept open for them.

Colorado Opposes Federal Control of Water-Power

The Legislature of Colorado has adopted a memorial accepting a suggestion of the Legislature of Oregon for a water-power conference. It calls attention to provisions of the State constitution and expresses the belief that any attempt by the federal government to exact in exchange for such rights any right of regulation or any compensation in excess of the fair market value of the rights granted is in violation of the constitutional right of the State and in impairment of the State's power to develop and control its own internal resources. The opinion is also expressed that the danger of monopolistic control of water-powers, asserted as a reason for the exercise by the federal government

of the above exactions in exchange for such rights-of-way, does not exist, since the State, by the exercise of its fundamental rights to regulate rates and service, can prevent monopolistic control, in full protection of its citizens.

The Legislature declares that it is not only the right and duty but also the exclusive privilege of the State to control the development of its internal resources. The Governor was requested to designate five members of the General Assembly to serve as a committee, with the Governor as chairman, to represent Colorado in the conference to be called pursuant to the resolution of the Oregon Assembly.

Electrical Exports

The summary of foreign commerce of the United States for February, 1915, issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce shows the following exports of electrical machinery appliances and instruments:

	February		Eight Months Ended February	
	1915	1914	1915	1914
Batteries	$109,214	$54,488	$519,165	$457,503
Dynamos or generators	127,565	206,392	1,374,137	1,603,691
Fans	10,206	36,985	98,906	288,390
Insulated wire and cables	95,641	153,607	765,381	1,584,793
Interior wiring supplies, etc., including fixtures	67,648	48,954	418,072	503,659
Lamps—				
Arc	$8,031	$6,918	$24,995	$66,311
Incandescent—				
Carbon filament	9,862	14,255	47,100	143,640
Metal filament	51,373	10,857	272,482	156,680
Total lamps	$69,266	$32,030	$344,577	$366,631
Meters and other measuring instruments	22,807	.....	220,749	.....
Motors	325,224	241,488	1,964,356	3,262,964
Static transformers	46,646	142,888	455,398	1,144,337
Telegraph instruments (including wireless apparatus)	6,589	6,874	51,069	89,845
Telephones	101,957	157,851	905,133	1,147,899
All other	700,804	848,956	5,088,478	7,274,092
Total all exports	$1,683,567	$1,930,513	$12,205,421	$17,723,804

How the Jobber Serves the Manufacturer and Small User

The usefulness of the electrical supply jobber in distributing the products of the manufacturer widespread among thousands of users, and particularly in saving both manufacturer and user the annoyance, delays and expense of handling countless small orders which average only a few dollars each, was emphasized by Mr. W. W. Low, president of the Electric Appliance Company, Chicago, in his address before the joint meeting of manufacturers and jobbers held during the Electrical Supply Jobbers' Association convention at Chicago, March 18.

Electrical manufacturers do not realize that the electrical jobbers handle thousands of small orders daily in distributing the manufacturers' goods to users, said Mr. Low. During 1914 the Electric Appliance Company, cited the speaker, shipped over 60,000 orders averaging $3.26 each. Of the total number of orders handled, only 3.4 per cent were of such size as would be considered reasonable orders if received by the manufacturer. The rest would be viewed as annoyances and nuisances, said Mr. Low. Again, of 167 orders for conduit received during January—a poor month—ninety-six, or 57.5 per cent, averaged $3.18 per charge.

"What would my friend the conduit manufacturer think if he had to take, edit, assemble and take down to the freight depot 57.5 per cent of his conduit business on orders averaging $3.18?" asked Mr. Low. "He would either be compelled to go out of business or his business would be reduced to a minimum compared to what he is doing now. And yet this is one of the lines which, according to the ideas of many, goes out in large quantities."

Convention Plans of Electrical Contractors

The convention of the National Electrical Contractors' Association will be held in San Francisco, Cal., from July 20 to 24. The convention committee, of which Mr. James R. Strong, New York, is chairman, has issued a number of bulletins in relation to the convention. These are supplemented by special bulletins by Mr. V. C. Gilpin, master of transportation, describing scenic points.

Members from New York will leave via the New York Central lines at 5:30 p.m. on July 10. From Chicago a special train will be run to San Francisco over the Atchison, Topeka & Santa Fé Railway. A day will be spent at the Grand Canyon and about two days in Los Angeles. Several routes for the return trip are described by the committee. Tour A is by way of Portland, Yellowstone National Park, Salt Lake City, Colorado Springs, Denver and Chicago. Tour B covers Portland, Salt Lake City, Colorado Springs, Denver and Chicago. Tour C includes Portland, Seattle, Victoria, Vancouver, the Canadian Rocky Mountains, St. Paul and Chicago. Tour D is the direct route to Ogden and Chicago. Applications for reservations should be made on or before June 12 to Mr. V. C. Gilpin, master of transportation.

The official train will reach Los Angeles at 2:40 p.m. on July 15, and the travelers will be greeted by Mr. John C. Rendler, former national director, who is in charge of the entertainment features of that section. The party will be met at the train by automobiles under the guidance of the electrical people and driven through Los Angeles and its suburbs and Pasadena. Mr. C. H. Heilbron, of San Diego, is in charge of the entertainment committee in that city, where July 16 will be spent. Additional points in the Los Angeles district will be visited on July 17.

The Clift Hotel has been selected by the committee as the San Francisco headquarters. As the number of rooms obtainable is limited, prompt applications for reservations are suggested. The evening of July 22 has been designated officially as "National Electrical Contractors' Night" at the Panama-Pacific Exposition. July 24 has been designated officially as "National Electrical Contractors' Day." The Oregon Electrical Contractors' Association urges as many members as possible to stop in Portland on the return trip.

Increase in Rates in London

Rates for electrical energy have been increased by the principal companies in London, England, effective on April 1. The increases in rates follow large advances in the cost of coal. As explained by Mr. Haydn Harrison in the article published in the ELECTRICAL WORLD of April 17, 1915, page 974, the shortage of labor at collieries and the congestion of railways on account of military movements have led to a large increase in the cost of coal delivered at generating plants.

Investigation of New York Commissions

Majority and minority reports were presented by the legislative investigating committee which has been investigating the New York Public Service Commissions. The majority believes the Democratic members should be retired. The report, however, does not make a positive recommendation but expresses a desire to permit Governor Whitman to exercise his own judgment in the matter.

Majority Report

In the complaint as to rates in Westchester County, it appears, the majority report says, that seven years elapsed from the time the complaint was filed to the final determination. The people were entitled to a much more prompt determination. There is no provision in the law for repayment to consumers of the excess price charged over rates found reasonable. This fact should have had influence with the commission and should have resulted in a very much more prompt determination.

The report says that in the Canadian-American Power Company case it appears that at least $1,000,000 of the allowance of stock was for rights obtained under a contract or license, and a capitalization of such intangible rights was permitted in violation of the law, which specifically forbids the capitalization of intangible properties.

Minority Report

The minority report criticises findings of inefficiency against the commissioners of both districts and condemns the majority recommendations as reactionary and destructive of public utility regulation. The minority condemns three changes recommended by the majority as follows:

"1. The destruction of the commissions' power to supervise the issuance of stocks and bonds, with a resultant flood of watered securities and a return to the period of stock inflation, exhaustion of railroad property, high rates and poor service to the public.

"2. An increased liability upon stockholders of utility corporations similar to that in national and state banks.

"3. Taking away from the commissions their accounting, supervising, and accident powers."

Trade Commission and Export Combinations

Hearings will be held by the Federal Trade Commission in New York City during the first week in May on questions pertaining to export-trade development. Foreign-trade associations will be given an opportunity to submit information and recommendations. In view of the foreign-trade combinations of English and German manufacturers and exporters, it is expected that testimony bearing on the extension of similar principles to manufacturers of this country will be presented.

The federal trade committee of the Chamber of Commerce of the United States has held a meeting with the Federal Trade Commission in Washington. The two agencies have taken up together a number of matters, particularly the possibility of establishing co-operative selling combinations among American manufacturers for foreign trade.

Committees representing the Merchants' Association of New York, the Illinois Manufacturers' Association and other bodies are to make representations to the commission on the subject. If, after the commission completes its investigation, it finds that changes in the anti-trust laws are necessary to allow the suggested combinations, and if the commission comes to the conclusion that the suggested combinations can be put into effect without harm, the commission will recommend to Congress what revisions should be made in the statutes.

Competitive Plant Movement in Cincinnati

At a hearing before the light committee of the Cincinnati City Council on April 19 on the application of the Diamond Light Company for a franchise, President W. W. Freeman of the Union Gas & Electric Company stated that the day has passed when competition between public service corporations is effective. The general policy now is to require good service at reasonable rates from one company that is able to fill the requirements.

In reply to allegations of labor-union representatives that the Union company is unfair, Mr. Freeman asserted that it has not one dissatisfied employee. He said that if labor unions had dominated the property he could name several instances when the company could not have given the continued, uninterrupted service that is needed for the safety of the city and its residents.

Mr. Joseph O'Hara said that the Diamond company had no intention of defying the Council when it sought to do business without a franchise, but that it had acted in good faith. He argued that the Council had no right to grant an exclusive franchise, and that cheaper rates would result from favorable action upon this company's application.

Central-Station Dividend from Appliance Sales

The Cambridge (Mass.) Electric Light Company declared recently an extra dividend of 6 per cent, or $54,000, from the proceeds of appliance merchandising during the last six years. The company does not maintain a store for the sale of appliances and has only three regular solicitors, but by a profit-sharing arrangement with employees the management has been remarkably successful in introducing electrical conveniences. For about three years every employee who is the means of selling an electric appliance, motor, washing machine, etc., has received a commission of 10 per cent on the list price of each article when sold, and these commissions now amount to at least $100 a month, and sometimes more.

Each of the eighty-eight employees is an appliance solicitor, and both in and out of regular working hours the task goes forward. Customers are solicited regularly through the mails in connection with bills. Appliances are sold at about 33 1/3 per cent above net. In declaring the extra dividend, which has no connection with income from the sale of electrical energy, the company's officials felt that the Massachusetts Gas and Electric Light Commission would have no reason to criticise the policy, since the funds disbursed came from appliance merchandising, pole rentals, and business wholly apart from the supply of energy.

Pennsylvania Commission Nominations Recalled

Governor Brumbaugh notified the Pennsylvania Senate on April 15 that he had recalled the recess nominations of the seven members of the Public Service Commission made by his predecessor. His letter was brief, stating simply that his predecessor nominated on Jan. 5, 1915, by the advice and consent of the Senate, the members of the commission. After stating the names of the members and the terms for which they were appointed, Governor Brumbaugh said that he recalled the nominations.

Miscellaneous News Notes

Hydroelectric System in Ontario.—The Council of Ridgetown, Ontario, has decided to submit a by-law to the people calling for the installation of a hydroelectric system.

New York Telephone and Telegraph Bill Defeated.—The New York State Senate defeated on April 20 the Foley bill to place all telephone and telegraph companies in the State under the jurisdiction of the New York Public Service Commission, Second District.

Report on Ohio Bill.—The judiciary committee of the Ohio House of Representatives has decided to report for passage the Clark bill, placing gas, oil and electrical companies which transport and sell their products to distributing companies under the supervision of the Public Utilities Commission.

Contractors and Municipal Plant Unite to Give Electric Show.—Seizing the opportunity offered by the completion of the rehabilitation of the municipal plant at Jamestown, N. Y., the members of the water and lighting commission and the electrical contractors of the city gave an electric show at the plant on April 8, 9 and 10. Visitors were shown the new power station equipment and were invited to examine displays and electrical-appliance booths erected by the contractors in the station building.

University of Illinois Electric Show.—Nearly 6000 persons attended the fifth annual electrical show given by the students of electrical engineering of the University of Illinois at Urbana, Ill., April 8 to 10. Features of the exhibition were a huge Tesla coil giving 8-ft. sparks, the control of an automobile by "wireless," a working model of the Panama Canal, and an electric railway system with operative signals. A number of commercial exhibits were also shown by manufacturers and salesmen.

Fire in Horn & Brannan Fixture Factory, Philadelphia.—Approximately $200,000 damage was done by a fire that swept through the gas and electric fixture plant of Horn & Brannan, 427-437 North Broad Street, Philadelphia. The second, third and fourth floors of the building were almost entirely destroyed. At the time the plant was temporarily deserted because of a holiday. Mr. James Brannan, a member of the firm, places the loss at about $200,000. The building was insured, although not to its full value.

Prohibition Increases Assessed Valuation of Public Utility Properties.—According to advices from Des Moines, Ia., the assessed valuation of the Des Moines Electric Company was raised from $1,330,000 to $1,800,000 and that of the Des Moines Water Company from $2,200,000 to $2,670,000. The increase in the valuation of these two public utilities is the first step by the city assessor to make up for the loss caused by the closing of its saloons. Increases are expected in the valuations of the Des Moines Gas Company and the Railway Company.

New York Water-Storage Bill.—The New York State Senate passed on April 20 the Wood water-storage bill by a vote of 28 to 15. The bill is designed to permit the creation of river-regulating districts under the direction of a commission consisting of the conservation commissioner, the Attorney-General and the State engineer. A board of three to be named by the Governor would have direct control of each district. Reservoirs would be constructed in each district for the storage of water, and the expense would be apportioned between the State and the property directly benefited.

Safety Lessons in Motion Pictures.—Motion pictures prepared recently for the Underwriters' Laboratories of Chicago and shown for the first time before the Chicago Electric Club on April 15 present the methods used in the laboratories for testing the fire hazards of various products. Fuses, wire, flatirons, insulating materials and sockets were among the electrical goods shown under test. Mr. J. E. Latta, special agent for the laboratories, explained the pictures and announced that the films would be used in many places to teach safety and to show something of the fire-prevention work at the laboratories.

Salary Increases at Cleveland Municipal Plant.—The city board of control of Cleveland, Ohio, has increased the salaries of a number of employees of the municipal lighting division. The superintendent of electrical construction was advanced from $1,800 to $2,100 per year, the superintendent of the meter department from $1,500 to $1,800, and the chief cost clerk from $1,500 to $1,650. The position of assistant superintendent of construction was created with a salary of $150 per month. The office of statistician, another new position, will carry a salary of $1,080 per year. Time clerks were changed from a wage scale based upon the number of hours employed to a monthly salary.

Electric Show at Toronto.—The Ideal Home and Electric Show at Toronto, Ont., was opened on April 12 by the Premier of Ontario, who spoke for a few minutes on what an ideal home means. Grouped in the hall were many beautiful as well as useful articles that go to the making of the ideal home. Electrical devices for housework were displayed, a study of which showed housekeepers what a labor-saving medium the "white coal" of Ontario is. After a most successful week the show was closed on April 17. The attendance during the week was approximately 60,000. Exhibitors who were interviewed stated that the results were much beyond their expectations. Mr. Wilcox, who organized the show, said it will be an annual event.

Electrically Cooked Dinner in Brooklyn Polytechnic Laboratory.—On the evening of April 25 the advisory council of the Polytechnic Institute, Brooklyn, N. Y., held its annual meeting and had dinner in the electrical laboratory. All food was cooked by electricity, a portion of it being prepared by the guests themselves with electric toasters and percolators. Most of the cooking was done on two Simplex ranges and a Hughes range. Use was also made of electrically heated waffle irons for making waffles. After the dinner various electrical experiments were carried out for the entertainment of the guests. Dr. Samuel Sheldon, professor of physics and electrical engineering, planned the banquet, the electrical appliances being furnished by the Edison Electric Illuminating Company of Brooklyn.

Municipal Plant Bills in Ohio.—Miss Rose Moriarity, deputy city auditor of Elyria, appeared before the public utilities committee of the Ohio House of Representatives on April 19 and spoke against the Behne bill, which seeks to place responsibility for financing municipal plants directly upon the plants instead of upon the city credit as a whole. She denounced it as an attempt to prevent cities from engaging in public-service business. A plan is on foot to establish a joint plant for Elyria and Lorain. Senator Behne and Mr. J. C. Martin, of the Ohio Electric Light Association, replied to her address. The Senate committee on public utilities has reported the Stone bill for passage. It would place municipal plants under the supervision of the Public Utilities Commission like private corporations.

Tennessee State Assessors to Assess Hydroelectric Properties for State, County and Municipal Purposes.—A bill enacted by the General Assembly of Tennessee at its 1915 session gives authority to the state tax assessors to assess for valuation for state, county and municipal purposes the properties of all hydroelectric power companies in the State of Tennessee. In arriving at the valuation of the property for taxation the assessor will consider the capital stock of the company, the corporate property, franchises, gross receipts and the expenditure for betterments, improvements and repairs. He will further consider the market value of the stocks and bonds and all other facts that may throw light upon and show the value of the property to be assessed. It is enacted that the lines, poles, towers, transformers, machinery and equipment in the power houses and all other property of the company except lands, buildings and personal property is to be known as distributable and to be valued separately from the property. After ascertaining the total value of such distributable property wherever situated, and after having deducted from this value $1,000, the assessors are to divide the remainder by the number of miles of the entire length of the line, and the result will be the value per mile of such distributable property for the purpose of taxation. This value when multiplied by the number of miles in the State is to be the amount assessed by the State; when multiplied by the number of miles per county is to be the value assessed by the county, and when multiplied by the number of miles per municipality is to be the value assessed by the municipality. All lands and buildings are to be valued separately and assessed as localized property.

Associations and Societies

Electrical Supply Jobbers' Association—The next quarterly meeting of the Electrical Supply Jobbers' Association has been set for June 15, 16 and 17 at the Hotel Statler, Detroit, Mich. Mr. Franklin Overbagh, 411 South Clinton Street, Chicago, is secretary.

Dayton Company Section, N. E. L. A.—Mr. H. I. Fox, illuminating engineer for the Dayton Power & Light Company, Dayton, Ohio, addressed the company N. E. L. A. Section meeting April 8 on engineering, structural and illuminating features of the San Francisco exposition.

Connecticut Lighting Association at Hartford.—Sales topics were discussed at the monthly meeting of the Connecticut Lighting Association held at the Hotel Bond, Hartford, Conn., April 9. The twenty-four central-station executives present were entertained at luncheon by Capt. F. W. Prince, superintendent of the Hartford Electric Light Company.

Jovians at Erie, Pa.—At the April meeting of local members of the Jovian Order at the Reed House, Erie, Pa., a discussion on organization matters was led by Mr. C. E. Sutton, who is statesman-at-large of the order. Mr. C. E. Corrigan, president of the National Metal Molding Company, who had been scheduled as the principal speaker of the evening to talk on "Concentric Wiring," was unable to be present on account of illness, and a later date was set for his address.

New York Jovian Meeting.—At the lunch of the New York Jovian Electrical League at the Hotel Martinique, New York, on April 21, Mr. A. J. Marshall, secretary of the Electric Vehicle Association, spoke on "The Electric Vehicle in Taxi and Bus Service." He said that by the autumn of this year several hundred electric vehicles will be engaged in taxicab service in New York City. A report on the "jitney bus" was made by the following committee: Messrs. A. E. Clifford, ELECTRICAL WORLD; Joseph Becker, United Electric Light & Power Company, and Martin Oberlander, Western Electric Company. Mr. Roger Williams, Simplex Electric Heating Company, was chairman of the day.

Georgia Electrical Contractors' Association.—At the annual meeting of the Georgia Electrical Contractors' Association held at the Hotel Ansley, Atlanta, Ga., April 15 and 16, the following officers were elected for 1915; President, Mr. H. E. Lowe, Macon, Ga.; vice-president, Mr. J. M. Clayton, Atlanta, Ga.; secretary, Mr. J. A. Wier, Athens, Ga.; treasurer, Mr. W. L. Bailey, Atlanta, Ga., and member board of directors National Electrical Contractors' Association, Mr. T. H. McKinney. During the administration of the retiring president, Mr. R. M. Walker, Rome, Ga., the association's membership has been increased to twenty-eight. The next meeting will be held at Columbus, Ga., July 5.

Iowa Electrical Contractors Meet at Keokuk.—At the fourth semi-annual convention of the Iowa Electrical Contractors' Association held at Keokuk, Ill., April 20, 21 and 22, officers for the year were elected as follows: President, Mr. Floyd A. Wallace, Des Moines; vice-president, Mr. J. T. Fowler, Cedar Rapids; secretary-treasurer, Mr. M. T. Humphrey, Waterloo, and director of the National Electric Contractors' Association, Mr. G. O. May, Sioux City. More than two-thirds of the members of this comparatively young association attended the convention, and it was generally conceded that in bringing out helpful discussion and in providing enjoyable entertainment the Keokuk convention was the best in the association's history.

Jovian Rejuvenation in Kansas City.—At the largest rejuvenation of the Kansas City Jovian League yet held forty-two men took the obligation on April 17. The occasion marked the real coalition of the Jovian League with the Electric Club of Kansas City and the unification of efforts. The new members included Messrs. P. J. Kealy and R. T. Woods, the board of control of the Metropolitan Street Railway system and a number of officials of the Kansas City utilities. Reigning Jupiter Homer E. Niesz urged co-operation for electrical development and the encouragement of the Vulcan Order. About twenty-five visiting Jovians were present from St. Joseph, St. Louis and Chicago. Mr. A. C. Cornell, of St. Louis, took the part of Avrenim.

Electric Club in Springfield, Mass.—An electric club was formed in Springfield, Mass., on April 14 with the following officers: President, Mr. Kurt R. Sternberg, Dickinson Manufacturing Company; secretary, Mr. L. J. Kemper; treasurer, Mr. Fred Rogers, Jr., General Electric Company; chairman of publicity committee, Mr. C. M. French, Wagner Electric Manufacturing Company; executive committee, Messrs. W. P. Hodge, A. W. Hopkins and W. K. Tuohey. The executive committee was directed to prepare a definite plan of organization for report at the next meeting to be held on April 26. At the organization meeting talks were made by Messrs. W. L. Mulligan, United Electric Light Company; Arthur J. Newell, and others. The new club's membership includes manufacturers, inspectors, contractors and central-station men, and it is planned to keep in close touch with other organizations of similar character.

Joint Meeting on Illumination.—At the joint meeting of the National Electric Light Association, the National Commercial Gas Association and the Illuminating Engineering Society in the auditorium of the Consolidated Gas Company's Building, New York City, on April 18, Mr. Norman Macbeth, of the I. E. S., presented a paper entitled "Value of the Illuminating Engineering Society to Commercial Men." Mr. Macbeth performed a number of experiments and showed a number of lantern slides demonstrating the fact that the human eye is incapable of judging illumination values and that the commercial man must have some idea of illumination problems in order to lay out a satisfactory installation. Mr. R. F. Pierce, of the N. C. G. A., read a paper entitled "Illuminating Engineering as Applied to the Business of the Gas Company." Mr. Holton H. Scott, president of the N. E. L. A., told of the work being done by this society, emphasizing the value of company sections.

Public Service Commission News

Minnesota Commission

The House of Representatives has passed a bill upon which the House and Senate have agreed giving jurisdiction of telegraph companies to the Railroad and Warehouse Commission. The commission is to have authority to make rates, to acquire physical connection between competing lines and make other regulations.

Indiana Commission

The Winona Electric Light & Water Company has given notice that it will surrender its franchise, and take an indeterminate permit.

It is understood that Governor Ralston will reappoint Messrs. Charles J. Murphy, of Brookston, and Charles A. Edwards, of Huntington, members of the commission when their terms expire on May 1.

Wisconsin Commission

The commission has ordered the Wisconsin-Minnesota Light & Power Company to extend electric service to two applicants residing some distance beyond the present limits of the company's distribution system in Chippewa Falls. By applying the data contained in the company's report of last year to the formula developed in the ELECTRICAL WORLD of Feb. 7, 1914, and checking the result with the normal investment and operating costs properly chargeable to the proposed extension of the distribution system, the commission determined that the additional investment would be justified by the probable total yearly revenue to be derived from the applicants. The order specifies a minimum yearly revenue which must be guaranteed to the company.

In the case of the Beloit Water, Gas & Electric Company the commission has issued a supplementary order modifying the tentative rate schedule contained in its order of July 10, 1911. After several years of operation under the schedule of reduced rates it appears that the load-factor of the electric plant is not so high as was anticipated. The trouble was attributed to the fact that the schedule of rates as formulated did not offer sufficient inducement to off-peak consumption. In order to give the off-peak appliance load the benefit of lower rates, the supplementary order provides

that the first 1000 watts of appliance load shall be excluded in estimating the active load. The schedule of power rates was also adjusted with the view of increasing the load-factor by offering inducements to long-hour users.

Illinois Commission

On a petition brought by the Western United Gas & Electric Company, Aurora, Ill., the commission has ruled that the company may charge a higher rate for gas where a prepayment meter is in use than where ordinary meters are used. It is not permissible, however, to charge consumers who are in arrears a higher rate than other consumers of the same class. Last December the commission decided that the company could not charge prepayment meter patrons $1 and other patrons 90 cents per 1000 cu. ft. Now, however, the commission reverses its ruling, as the company showed that it costs more to take care of prepayment patrons and that the prepayment meters are installed at the request of consumers.

New York Commissions

On motion of Commissioner William Hayward, the First District Commission has appointed a special committee to look into all service orders previously adopted and to report whether any are obsolete or unworkable. Commissioner Hayward stated that in his opinion it would be better for the commission to have ten good orders which could be enforced that a hundred about which there is any doubt. Chairman McCall appointed Commissioners Hayward and Williams as the committee.

The United Electric Light & Power Company has made application to the New York Public Service Commission, Second District, for a conference upon rates as a result of the new schedule of the New York Edison Company. The United company was not affected directly by the recent agreement covering the rates charged by the New York Edison Company.

Mr. Percival Robert Moses has written a complaint to the commission regarding the principle on which the New York Edison Company rate schedule was based. He objects to the discount on account of quantity and asserts that it permits the middleman to take profits which should be shared with the actual consumer. Mr. Moses also questioned the regulation that permitted the owner of two buildings not more than 150 ft. apart to combine the consumption of energy in these structures and thus obtain lower rates. He declares that this constitutes an unfair advantage to a property owner. He says that the object of the regulation is to prevent the erection of competing private generating plants. The company, he says, does not care whether or not it makes a profit on a particular building so long as it earns a profit on the entire system and the effect of the principle underlying the schedule is to hold up rates for consumers of moderate amounts.

The Second District commission has refused to allow the Lima-Honeoye Electric Light & Railroad Company and the Lima-Honeoye Light & Railroad Company to separate their electric light from their railway business. The commission holds that this would be a violation of a lease of the properties between the two companies, approved by the commission in 1910. At that time one of the two companies, both of which are owned by the same interests, leased its property to the other for five years. It has been found since that the electric-light property is profitable but that the railway is so unprofitable as to make joint operation unremunerative. Counsel for the company admitted at the hearing that under the circumstances, if the abandonment of the lease were sanctioned, the operation of the railroad property would be abandoned ultimately. Chairman Van Santvoord says:

"The proper question would be whether, having regard to the public welfare and rights as well as to the rights and interest of the owner and lessees of these two utilities, the commission may properly approve that which, if granted, will in effect constitute a default under a lease, the execution of which lease has been approved and authorized by the commission upon the express understanding that an efficient operation of both utilities would result therefrom and might be expected during the life of the lease. In this view of the case, approval by the commission of what is now proposed would be an improper exercise of its discretionary power, and the application must therefore be denied."

Personal

Mr. George D. Pratt has been nominated by Governor Whitman to be Conservation Commissioner of New York. Mr. Pratt is treasurer of the Pratt Institute of Brooklyn.

Mr. Kurt R. Sternberg, general manager of the Dickinson Manufacturing Company, Springfield, Mass., has been elected president of the new electric club, organized in that city.

Mr. John Hunter, chief engineer of power plants for the Union Electric Light & Power Company, St. Louis, Mo., has been appointed a member of the International Jury on Awards of the San Francisco Exposition.

Mr. G. H. Jenkins, formerly contract agent at the main office of the Greenfield (Mass.) Electric Light & Power Company, will succeed Mr. John J. O'Connell as manager of the Shelburne Falls branch of that company.

Mr. John J. O'Connell, who for the last three years has been manager of the Shelburne Falls branch of the Greenfield (Mass.) Electric Light & Power Company, has been transferred to the company's property at Amherst.

Mr. C. R. Butler, auditor of the Rutland (Vt.) Railway, Light & Power Company, has been appointed secretary-treasurer of the Binghamton (N. Y.) Light, Heat & Power Company and the Sayre Electric Company, Sayre, Pa.

Mr. Joseph D. Greenslete has resigned as electrical engineer with the General Electric Company at Schenectady, N. Y., to become chief operating engineer and assistant manager of the Visayan Refining Company, Cebu, P. I.

Mr. W. L. Hemingway, vice-president of the Mercantile Trust Company, Little Rock, Ark., has been elected vice-president and treasurer of the Little Rock Railway & Electric Company to succeed Mr. D. H. Cantrell, promoted to be president of the company.

Mr. James O. Carr, of Schenectady, N. Y., has been nominated by Governor Whitman of New York to succeed Mr. Martin S. Decker as a member of the New York Public Service Commission of the Second District. Mr. Carr has been one of the attorneys for the General Electric Company, stationed at Schenectady.

Mr. William O'Connell, county treasurer of Cook County, Ill., has been appointed a member of the Illinois Public Utilities Commission to succeed Mr. James E. Quan, resigned. Mr. Quan was appointed chairman of the commission to serve temporarily, his resignation being voluntary after a service of little more than one year.

Mr. G. Wilbur Hubley, until lately superintendent of the electrical department and of electrical construction of the Louisville Gas & Electrical Company, has accepted the position of chief engineer of the Sampson Engineering Company, which will establish a factory and manufacture an electrical automobile starting device in Louisville.

Mr. C. A. Cable, for the last five years chief engineer of the municipal water and electric lighting plant at Lansing, Mich., has tendered his resignation, which has been accepted to take effect May 1. A committee has been appointed by the president of the local commission to draft a resolution in appreciation of Mr. Cable's services.

Mr. J. E. Bigham has severed his connection with the Tampa (Fla.) Electric Company to engage in business for himself. Mr. Bigham has been president of the Southeastern Section of the National Electric Light Association, but has been succeeded in that capacity by Mr. C. M. Benedict, of the Charleston (S. C.) Consolidated Railway & Power Company.

Mr. D. H. Cantrell, formerly vice-president of the Little Rock (Ark.) Railway & Electric Company, has been elected president of that company to succeed the late Judge W. M. Kavanaugh. Mr. Cantrell, who is a member of the law firm of Rose, Hemingway, Cantrell, Loughborough & Miles, will continue to look after the company's legal business personally, at the same time directing the plans and policies of the organization.

Mr. Edward A. Deeds, vice-president and assistant general manager of the National Cash Register Company, Dayton, Ohio, and president of the Dayton Engineering Laboratories Company, has tendered his resignation to the president of

the former company, in order that he may devote all of his energies to the Dayton Engineering Laboratories Company, of which he is the founder. Mr. Deeds has seen this latter business grow from its experimental stage, started in an outbuilding on his premises, to one of the largest industries of its kind in the country. Mr. Deeds started with the National Cash Register Company fifteen years ago as electrical engineer.

Mr. Thomas Augustus Watson, who was associated with Dr. Alexander Graham Bell in the pioneer work on the telephone, and who during the recent ceremonies inaugurating transcontinental telephonic conversation was at the San Francisco end of the line and conversed with Dr. Bell 3500 miles away much as in their historic conversation over crude instruments between adjacent rooms in 1876, was himself a prolific inventor of telephones and telephone apparatus, and during the period from 1878 to 1886 no less than thirty-eight United States patents were granted to him for his inventions in telephone receiving and sending apparatus, signal systems, exchange systems, etc. At the age of thirteen young Watson entered the electrical workshop of Mr. Charles Williams in Boston, where he displayed considerable initiative in work on call bells, telegraph instruments, and other electrical devices of the day, as well as in the construction of steam-engines, the latter work leading to his activity in the shipbuilding industry many years later. In 1874 Mr. Watson, who was still working for Mr. Williams, constructed for Dr. Bell a number of instruments for his "harmonic telegraph." On June 2, 1875, the sticking of a transmitter spring caused the experimenters to realize that what is now known as the telephone would be practicable, and on March 10, 1876, when Mr. Watson was only twenty-two years of age, he had constructed the first telephone instruments and had heard the human voice reproduced by a telephone transmitter for the first time in history. From 1877 to 1881 Mr. Watson worked steadily in his laboratory. At that time the engineering department of the Bell Telephone Company consisted of Mr. Watson and two others. In 1881 he ceased his activity in telephone work and went abroad, returning in 1884, when he entered the shipbuilding business as a member of the firm of F. V. Wellington & Company. In 1900 he founded the Fore River Ship & Engine Company at Quincy Point, Boston Bay, at which plant many American and foreign "dreadnaughts" have been constructed. In 1903 Mr. Watson retired from active business, and he is now living at East Braintree, Mass.

THOMAS A. WATSON

Obituary

Charles F. Hills, president of the Franklin Electric Company, Hartford, Conn., died at his home in Elizabeth, N. J., on April 15, following a prolonged illness.

Kengo Makino, head of the department of electrical engineering, Waseda University, Tokio, Japan, died in that city Feb. 1. Mr. Makino was graduated from the Institute of Technology of Tokio in 1900 and for years was identified with the development of the electrical industry in Japan. In 1907 he was sent to the United States and entered Cornell University, graduating in 1908 with the degree of M. E., and the following year the degree of M. M. E. was granted to him. He was also honored with membership in the Sigma Xi society. After his graduation he went to Japan to organize the new department of electrical engineering of Waseda University. Mr. Makino was a frequent contributor to the electrical literature of his country. He was decorated by the Mikado for service in the Russo-Japanese war. A wife and four children survive him.

Corporate and Financial

Brookville (Ohio) and Lewisburg Lighting Company.—The Ohio Public Service Commission has authorized the company to issue at not less than par $5,000 par value of its capital stock for the construction of a distribution system.

Cedar Valley Power Company, Charles City, Ia.—The company has sold its property in the cities of Hampton, Clarksville, Parkersburg, Nashua and Charles City, and its hydroelectric power site on the Cedar River 11 miles above Charles City, to the American Gas Company of Philadelphia. The officers of the Cedar Valley Power Company had completed plans to erect a 26-ft. dam on the power site and to construct transmission lines. The Cedar Valley Power Company was capitalized at $1,000,000. A new company known as the Cedar Valley Electric Company has now been formed by the American Gas Company, and it is rumored that the construction plans of the former owners will be carried out substantially as they were originally outlined. Mr. C. W. Taggart, who has been superintendent of the St. Clair County Gas & Electric Company of Belleville, Ill., a property of the American Gas Company, will be placed in charge of the work and will have headquarters at Charles City.

Century Electric Company, St. Louis, Mo.—The company states that it has increased its capital stock, full paid, to $1,000,000 to enable it to take care of increasing business requirements. The company manufactures single-phase alternating-current motors and fans.

City Electric Company, San Francisco, Cal.—The California Railroad Commission has issued an order provisionally authorizing the company to issue $426,000 of first mortgage 5 per cent thirty-year sinking-fund gold bonds. The company may issue $250,000 of the bonds at 84 and interest at present. The proceeds are to be used to pay $85,785 due the Great Western Power Company for materials and supplies, and to defray the cost of extensions, additions and betterments, $124,215. The commission has authorized the company to amend its mortgage and deed of trust securing these bonds. As amended the trust deed provides that after $3,000,000 bonds have been issued the remaining $2,000,000 may be issued only up to 75 per cent of the actual cash cost or reasonable value of extensions, additions and betterments. After deduction of all operating expenses the earnings for twelve months within the fourteen months next preceding the issue must be at least twice the aggregate interest charges accruing on all obligations outstanding during the period of twelve months, plus twelve months' interest on the bonds proposed to be issued.

Coast Valleys Gas & Electric Company, San Francisco, Cal.—The company has been authorized by the California Railroad Commission to issue $10,000 of bonds.

Commonwealth Edison Company, Chicago, Ill.—The company has been authorized by the Illinois Public Utilities Commission to issue $10,921,000 of 5 per cent first mortgage gold bonds.

Consolidated Electric Company, Greenwich, N. Y.—The company has increased its capital recently from $75,000 to $150,000, the increase being issued from surplus account.

Great Shoshone & Twin Falls (Idaho) Water Power Company.—The collateral behind the 1910 and 1911 indentures was purchased recently by the protective committee for $487,500.

Illinois Northern Utilities Company, Dixon, Ill.—The company has been granted permission by the Illinois Public Utilities Commission to issue $640,000 first and refunding gold bonds.

Ithaca (N. Y.) Gas & Electric Company.—The New York Public Service Commission, Second District, has authorized the consolidation of the Ithaca Gas Light Company and the Ithaca Electric Light & Power Company into the Ithaca Gas & Electric Company. The new corporation will have $350,000 stock. The stock will be exchanged for that of the old companies. In the consolidation $150,000 of stock of the old companies will be canceled. The new company is also authorized to issue $434,000 of 5 per cent forty-year first mortgage bonds, of which $319,000 shall be used in

exchange, par for par, for $254,000 outstanding bonds of the gas company and $65,000 outstanding bonds of the electric company. Also $115,000 may be sold at not less than 90 to net $103,600 to fund $74,800 bills and accounts payable of the gas company and $28,556 of the electric company.

Kansas City Railway & Light Company.—Holders of the 6 per cent collateral gold notes due on Sept. 1, 1912, and of the first-lien refunding gold bonds have received letters from the respective protective committees stating that the franchise granted to the Kansas City Railways Company, the new company organized to acquire the street railway properties, would be forfeited should the railways company not acquire the railway properties by Jan. 7, 1915. The city, however, extended the time to July 7, 1915. It is not known whether another extension can be secured. The financial conditions created by the European war made it practically impossible to sell new securities to pay existing indebtedness in cash. In view of the situation and at the request of the committee representing a large majority of the stockholders the protection committees co-operated with the stockholders' committee in an endeavor to work out a plan to refinance the existing indebtedness by exchange for new securities. A plan was submitted to Judge Hook, but was disapproved by him, one of the reasons being that it provided for the continuance of the Kansas City Railway & Light Company's stock ownership in both the street-railway and the electric-light properties. An immediate separation of the stock ownership in the properties under existing conditions presents serious difficulties, and in view of the entire situation it may become necessary to foreclose very promptly the various mortgages.

Louisville (Ky.) Gas & Electric Company.—The company has sold $300,000 of 6 per cent notes, dated Oct. 1, 1914, and due on April 1, 1918. They are part of an authorized issue of $2,000,000, of which $750,000 are outstanding, including the present issue. The sale will remove all floating indebtedness and provide funds for extensions and improvements.

Mexican Northern Power Company, Ltd., Toronto, Canada.—President D. E. Thomson states that holders of the first mortgage bonds, at a meeting held on May 27, 1914, passed a resolution which deferred payment of interest due prior to Jan. 1, 1916, and authorized an issue not exceeding $3,000,000 bonds having priority in all respects to the first mortgage bonds. Prior-lien bonds were accordingly offered to bondholders and shareholders, but the response was disappointing. The company applied the proceeds of bonds sold and certain moneys borrowed on the security of bonds to the best advantage possible and was able, after strenuous efforts, to save the power house and equipment from serious injury by the excessive floods of the year and to store a large quantity of the flood waters. In consenting to the prior-lien bond scheme bondholders stipulated that not more than $1,000,000 should be issued without the consent of a majority of the bondholders present or represented at a meeting called for the purpose. It being impossible in the present financial situation to secure the funds necessary to complete the work without the removal of this restriction, the concurrence of bondholders in the necessary modification of the original resolution is sought.

Minneapolis (Minn.) General Electric Company.—An issue of 6 per cent notes due on June 1, 1917, is offered at 100½ and interest to net 5.75 per cent.

National Securities Corporation, New York, N. Y.—In connection with this company, which was organized recently to take over securities of the Idaho-Oregon Light & Power Company, the Idaho Railway, Light & Power Company and the Idaho Power & Light Company, Mr. W. J. Ferris, receiver for the Idaho-Oregon company, says: "The new company will have adequate capital to repair and improve all the plants whenever it is found necessary. It will also be in a position to develop this territory as it should be developed and to make whatever investments offer a fair return. The organization will be formed with new men interested, and practically all of the interests which waged the war between the companies here eliminated. New people have taken their places, and the company will be on such a basis that it can derive an equitable revenue from its investments. During the past two years none of the companies has been able to make any money. Money that was being spent hitherto in absurd and useless competition will be diverted now into channels that will mean the building up of the territory along broad lines."

New Orleans (La.) Railway & Light Company.—In discussing operations for the year ended Dec. 31, 1914, President D. D. Curran stated in his annual report that the increase in net income was very gratifying, particularly because operating expenses in the gas department had increased approximately $60,000, gas rates were reduced on April 1, electric rates were reduced on Dec. 1, and there was a fare reduction on the West End and Spanish Fort railway line. The statement for 1913 and 1914 follows:

	1914	1913
Operating revenue:		
Railway department	$4,398,507	$4,401,152
Electrical department	1,427,295	1,335,186
Gas department	1,186,322	1,158,094
Total	$7,012,124	$6,894,432
Operating expenses:*		
Railway department	$2,341,420	$2,439,154
Electric department	561,227	555,308
Gas department	526,224	425,107
Total	$3,428,871	$3,419,569
Net operating revenue*	$3,583,253	$3,474,863
Net revenue outside operations	8,012	11,791
Total net revenue*	$3,591,265	$3,486,654
Revenue deductions:		
Taxes	$761,223	$724,535
Uncollectible consumers' accounts	9,000	6,661
Total	$770,223	$731,196
Net operating income*	$2,821,042	$2,755,458
Miscellaneous income	45,551	34,763
Gross income*	$2,866,593	$2,790,221
Income deductions:		
Interest on funded debt	$1,709,451	$1,630,731
Other interest charges:	15,627	52,181
Dividends on stocks of lessor company owned by others	4,084	4,107
Taxes on non-operating land and improvements	17,345	16,559
Amortization of funded debt discount and expense	.....	23,375
Other income deductions	7,341	4,926
Total	$1,753,848	$1,731,879
Net income before deducting charges for renewals and replacements	$1,112,745	$1,058,342
Charges for renewals and replacements	189,618	180,813
Net corporate income	$923,127	$877,529
Less dividends on stocks of subsidiary companies held by others	4,013	4,770
Balance of net income carried to surplus	$919,114	$872,759

*Not including charges for renewals and replacements shown separately.

Pacific Gas & Electric Company, San Francisco, Cal.—At the annual meeting of stockholders in San Francisco, on April 14, President Frank G. Drum said that no announcement with regard to a common-stock dividend would be made by the board until May 1. The outgoing directors were re-elected with one exception, Mr. J. A. McCandless taking the place vacated by the resignation of Mr. J. E. Gladstone, of New York.

Philadelphia Electric Company, Philadelphia, Pa.—Notwithstanding business depression, the company made substantial progress, according to the report of President J. B. McCall for the year ended Dec. 31, 1914. The management has under consideration a plan to unify further the companies, having in mind future needs to meet the demands for service, especially when the present depression is lifted and new impetus is given to business. With this end in view, a firm of Boston engineers was employed on July 1, 1914, to make a complete appraisal of the properties. This work is being expedited so that the company will be able to prepare for any improvement in business. The statement for 1913 and 1914 follows:

	1914	1913
Gross earnings	$8,160,025	$7,815,615
Operating expenses and fixed charges	6,181,046	5,887,372
Net income	$1,978,979	$1,928,243
Less dividends	1,574,308	1,180,815
Surplus	$404,671	$747,428
Previous surplus	1,067,076	1,818,913
Deduct stock dividend	.....	1,499,265
Total surplus	$1,471,747	$1,067,076

Richmond Light & Railroad Company, New York, N. Y.—A comparative statement of the operations for 1914 and

1913, filed with the New York Public Service Commission, First District, follows:

Electrical department:	1914	1913
Operating revenue	$441,100	$446,471
Operating expense	281,291	297,981
Taxes	12,750	12,000
Uncollectible bills	1,208	.....
Operating income	$145,851	$136,490
Street railway operating loss	2,928	78,042
Total operating income	$142,923	$58,448
Non-operating income	7,811	6,561
Gross corporate income	$150,734	$65,009
Income deductions	129,805	116,549
Net corporate income	$20,929	*$51,540
Previous deficit	412,583	265,284
Surplus adjustments, net charge	42,838	95,760
Deficit at close of year	$434,492	$412,584

*Deficit.

Santa Maria (Cal.) Gas & Power Company.—The Railroad Commission of California has authorized the company to issue $25,000 of first mortgage 6 per cent bonds.

Southern Public Utilities Company, Charlotte, N. C.—An issue of $3,250,000 of first and refunding 5 per cent gold bonds due July 1, 1943, is offered at 94½ and interest. The bonds are secured by a direct first mortgage subject to $1,749,000 divisional bonds for the retirement of which this issue makes provision. The value of the property, exclusive of franchises, good will, etc., is stated to be $10,581,000. Escrow bonds can be issued up to only 70 per cent of the cost of extensions, improvements, etc., or of property purchased in fee, and then only when net earnings for the twelve months preceding are at least twice the interest charges on all bonds outstanding, including those to be issued.

United Railways Investment Company, Jersey City, N. J.—Having changed the fiscal year so as to end on June 30, as noted in the ELECTRICAL WORLD of March 20, the company has issued a general balance sheet and income account in order that stockholders may be advised of the affairs for the year ended Dec. 31, 1914, as usual. The income statement follows:

Income:		
Dividends on stocks owned	$1,808,688	
Interest on bonds owned	49,062	
Interest on bonds in sinking fund	33,463	
Interest on notes and accounts receivable, etc.	50,105	
Interest on Philadelphia Company dividend scrip	3,845	
Interest on bank balances	4,035	
		$1,949,198
Expenses		80,012
Interest and discounts		1,147,977
Net income for the year		$721,209
Profit and loss surplus at beginning of year		5,222,528
Profit and loss credit—discount on bonds purchased for sinking fund		75,146
Profit and loss surplus, Dec. 31, 1914		$6,018,883

Washington (D. C.) Railway & Electric Company.—The annual report of the company for the year ended Dec. 31, 1914, including that of the Potomac Electric Power Company, a subsidiary, shows that the business of the power company has experienced a satisfactory growth during the year. In the last twelve years the connected load of the power company has increased from 270,080 to 1,175,510 16-cp equipvalents and the number of meters installed from 4165 to 24,818. The total electrical output for 1914 was 104,708,274 kw-hr. No additions were necessary to the Benning plant during the past year, and none will be necessary during 1915. The comparative income statement for 1914 and 1913 follows:

	1914	1913
Gross income from operation	$5,048,435	$4,943,315
Miscellaneous income	33,891	10,222
Gross income	$5,082,326	$4,953,537
Operating expenses (including taxes)	2,863,736*	2,669,972
Net income	$2,218,590	$2,293,565
Fixed charges:		
Interest	1,147,534	1,104,576
Miscellaneous	29,583	22,339
Total	$1,177,117	$1,126,915
Surplus	1,041,473	1,156,650

*Includes depreciation of equipment for six months ended Dec. 31, 1914, in accordance with Interstate Commerce Commission's classification of accounts, effective July 1, 1914.

Manufacturing and Industrial

The Lighting Studios Company, Madison Avenue and Thirty-first Street, New York, will move into larger quarters in the Candler Building, New York, May 1.

The Richardson-Phenix Company, Milwaukee, Wis., manufacturer of lubricating appliances, has purchased the patents and manufacturing rights of the Osborne "NoKut" valve.

The General Insulate Company, 1000 Atlantic Avenue, Brooklyn, N. Y., has appointed Mr. A. F. Larrabee, 88 East Congress Street, Detroit, Mich., agent for its Michigan territory.

The Flaherty Manufacturing Company, Baltimore, Md., has obtained the right to manufacture an electrically operated vulcanizer formerly made by the Fearn Company, also of Baltimore.

A. Edgar Goetz, 51 Barclay Street, New York, who is engaged in a general electrical business, is about to move into larger quarters at 55 Barclay Street, running through to 56 Park Place.

The Hart Manufacturing Company, Hartford, Conn., will move its offices in New York from 203 Broadway to 30 Church Street, May 1. Mr. F. E. Watts is district manager in charge of these offices.

A. Mendelson, manufacturer of electrical fixtures and specialties, has leased a portion of the building at East Seventeenth Street and Emerald Court, Cleveland, Ohio, and will equip the space for factory purposes at once.

The Main Electric Manufacturing Company, 215 South Beatty Street, Pittsburgh, Pa., will move into new quarters at 500 Aiken Avenue, Pittsburgh, May 1, where the company will have three times as much space as it has in its present quarters.

Shapiro & Aronson, 20 Warren Street, New York, have appointed Mr. W. J. Justice, of Birmingham, Ala., as their agent for the Southern and Southwestern territories. They have also opened a showroom in connection with the building-material exhibit in the Insurance Exchange Building, Chicago, Ill., with Mr. J. J. Kidd in charge.

The Northwestern Electric Company, 611 West Adams Street, Chicago, Ill., manufacturer of the "Martin" rotary converter for use in electric vehicle garages and motion-picture theaters, will open an office in New York City in the near future. The new branch will be in charge of Mr. E. B. Forslund, who has been with the company in Chicago.

New Equipment for Central-Station Company.—The Merchants' Heat & Light Company, Indianapolis, Ind., has purchased a 6250-kva, 4000/2300-volt Westinghouse steam turbine for its Washington Street power house and has also bought a 1500-kva, 4000/250-volt, six-phase synchronous booster. The latter machine, which is to supply energy to the down-town direct-current network, will be placed in a remodeled building near the Claypool Hotel.

Demand for Motor Equipment for Making Military Uniforms.—The Edison Electric Illuminating Company, Brooklyn, N. Y., reports that a number of clothing establishments in the Brownsville district have ordered motors and auxiliary equipment for use in the manufacture of army clothing. Several companies have originated solely for the purpose, it is asserted, of making uniforms for foreign powers. There is especially a demand by these manufacturers for fractional-horse-power machines.

The Remy Electric Company, Anderson, Ind., manufacturer of starting, lighting and ignition devices for automobiles, is building a new plant on East Grand Boulevard, Detroit, Mich., which will contain 18,000 sq. ft. of floor space. The building, it is expected, will be completed June 1 and will be ready for use by the company's engineering, sales, experimental and installation departments and experimental machine shop and drafting room. The company will maintain its factory at Anderson, Ind. The new plant has been built at Detroit because the bulk of the company's business is in the Detroit territory.

The Bureau of Safety, Chicago, which originated as a department of the Middle West Utilities Company and later took over the safety work of the Commonwealth Edison Company and the Public Service Company of Northern Illi-

nois, has now been incorporated and will henceforth be operated separately as a firm of safety counselors. The officers of the new organization are: President, Mr. George Otis Spencer; vice-president, Mr. Bernard Flexner, and secretary-treasurer and general manager, Mr. Charles B. Scott. The company will have offices at 417 Merchants' Loan & Trust Building, Chicago.

Renewed Business Activity in Internal-Combustion Engine Field.—The Lewis Electric Welding & Manufacturing Company, Toledo, Ohio, manufacturer of material for internal-combustion engines, is anticipating a revival of business after the next presidential election and is consequently increasing the size of its plant. The company has recently noted considerable improvement in business, but orders usually come in for very small quantities and quite often for rush delivery, indicating that customers are building only for immediate delivery and are not stocking their products. The company reports that the business of its gray-iron foundry is the same as it has been all winter and that the foundry is operating from day to day on small orders.

The Beardslee Chandelier & Manufacturing Company, of Chicago, Ill., and the D. J. Braun Manufacturing Company, of Chicago, have been consolidated and will be operated under the name of the former concern. Mr. D. J. Braun and Mr. S. D. R. Braun, who have been respectively president and vice-president of the D. J. Braun Manufacturing Company, will retire from business. Mr. Charles G. Ricklefs, treasurer, and Mr. Daniel Hesly, secretary of the Braun company, will join the staff of the Beardslee company, Mr. Ricklefs taking charge of the sales department. The D. J. Braun Manufacturing Company is well known throughout the country and is one of the oldest fixture-manufacturing concerns in Chicago. It was established in 1874 and was first incorporated in 1888.

Electric Ranges and Ovens in Flour Company's Exhibit at San Francisco.—A number of electric ranges and bake ovens made by the Hughes Electric Heating Company, Chicago, Ill., are being used in the exhibit of the Sperry Flour Company at the San Francisco Exposition. The exhibit covers a space of 6600 sq. ft. and includes a three-story flour mill in operation, with a daily output of ninety barrels of flour, a bakery, demonstrating booths, etc. Electric cooking is performed by girls. In a miniature laboratory a Hughes oven is also used. In the flour booth, as it is called, is a bake oven, and in the cereal booth there is an electric range. In connection with the exhibit several displays are made in which the uses of flour in various countries are demonstrated. All the cooking is done electrically.

The George Cutter Company, of South Bend, Ind., which for the last two years has controlled the J. Lang Electric Company of Chicago, has decided to close the latter's factory and to concentrate its manufacturing processes at the South Bend works. Mr. Warren Ripple and Mr. R. S. Ripple, who were formerly president and secretary-treasurer respectively of the J. Lang Electric Company, are now holding the offices of president and secretary-treasurer of the George Cutter Company. Mr. Otis B. Duncan, who has been general manager for the J. Lang Electric Company and Chicago sales agent for the George Cutter Company, will continue to represent the latter organization in Chicago and will have offices at 1311 Steger Building. The J. Lang Electric Company was established about twenty-five years ago by Mr. James Lang.

Future of Electric-Welding Industry Promising.—Mr. W. B. Elliott, president of the Welding Materials Company, 114 Liberty Street, New York, manufacturer of variable-voltage arc welders, recently stated to a representative of the ELECTRICAL WORLD that a number of inquiries are being received from railroad, street railway and automobile interests. The railroads are becoming increasingly interested in electric welders and are finding them especially well adapted, Mr. Elliott declared, for use in repairing locomotive frames and boilers. Similarly in the manufacture and repair of automobiles the increasing use of welding machines is evident. Mr. Elliott said that his company has noted an improvement in the general business situation during the last few months and is, of course, expecting considerable improvements in the near future.

Uses of Conduit in Chile.—According to Mr. Verne L. Havens, a commercial attaché reporting from Santiago, Chile, electric lighting is general in the cities of Chile, particularly in Santiago and Valparaiso, steel conduit being employed in steel and concrete buildings and brass conduit in brick and adobe houses. Mr. Havens states that an electrical contractor has informed him that about 10 per cent of the wiring is done with steel conduit, between 60 and 70 per cent with brass conduit, and the remainder with porcelain insulators. Practically all the conduit comes from Germany, the steel tubing being threaded. So-called Bergmann tubing is generally used in Chile, especially by the lighting companies of Valparaiso and Santiago. Mr. Havens states that an inspector of electrical installation is employed by the Chilean government, and he suggests that manufacturers or contractors who are interested in the uses of conduit in Chile write to this inspector.

Autumn Best Season for Vacuum Cleaners in New York.—Mr. G. L. Lund, agent in New York for the Duntley Products Company, Erie, Pa., recently stated to a representative of the ELECTRICAL WORLD that the greatest demand in his territory for vacuum cleaners is in September and October. At this time of the year large numbers of people are returning to their city residences and general cleaning is then very much in vogue—hence the big season for vacuum cleaners. Mr. Lund declared that spring is also a good time for the vacuum-cleaning industry. Many machines made by the Duntley company are being used for cleaning motors and generators. Among the users of machines for this purpose is George Ehret, a New York brewer, who is employing a machine which is operated by a 1-hp motor and is equipped with special nozzles for cleaning, three generators rated at 100 kw, 300 kw and 400 kw respectively. The Autopiano Company of New York is also using machines made by the Duntley Company for cleaning pianos and the Estey Organ Company of New York for cleaning church organs.

Utility Companies Order High-Grade Instruments.—Exemplifying the earnest spirit of co-operation in which operating utility companies are working with the public service commissions, recent orders for measuring instruments placed by several companies operating in Illinois are of interest. The companies, in complying with the mandates of the Illinois State Utilities Commission, have ordered, for use in regular portable service, it is reported, high-grade meters such as are used in standard laboratory work. The Illinois Traction System, Peoria, has placed an order with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for nineteen graphic voltmeters, twenty portable standard watt-hour meters and nineteen portable voltmeters, together with a number of other miscellaneous portable instruments of the laboratory type. The Southern Illinois Light & Power Company, Hillsboro, Ill., has also ordered eight portable graphic voltmeters and two ammeters of the same type, four portable wattmeters, two portable voltmeters and ammeters, two portable current transformers, and two switchboard-type graphic voltmeters, together with a varied assortment of other types of laboratory instruments.

NEW YORK METAL MARKET PRICES

	April 13 Selling Prices Bid	April 13 Selling Prices Asked	April 20 Selling Prices Bid	April 20 Selling Prices Asked
Copper	£ s d		£ s d	
London, standard spot*	71 17 6		75 15 0	
Prime Lake	16.62½		17.50	to 17.75
Electrolytic	16.37½		17.12½	to 17.37½
Casting	15.87½		16.75	
Copper wire base	17.37½		18.50	
Lead	4.20		4.20	
Nickel	42.00	to 45.00	42.00	to 45.00
Sheet zinc, f.o.b. smelter	13.50		13.50	
Spelter	10.00†		11.25†	
Straits tin	57.00†		46.00†	
Aluminum, 98 to 99 per cent	18.75		18.75	

*OLD METALS

Heavy copper and wire	14.50	15.50
Brass, heavy	9.75	10.50
Brass, light	8.62½	8.75
Lead, heavy	3.95	3.95
Zinc, scrap	7.25	8.50

*COPPER EXPORTS

Total tons to April 20 2,973

*From daily transactions on the New York Metal Exchange.
†Nominal.

New Incorporations

The Cache Valley Electric Company, of Logan, Utah, has been incorporated with a capital stock of $25,000. A. F. Laub is president and H. L. Payton secretary.

The Laurinburg Light & Power Company, of Laurinburg, N. C., has been incorporated with a capital stock of $100,000 by John T. McNair, A. M. Fairly and James A. Jones.

The Central Telegraph & Electric Company, of Cleaton, Ky., has been granted a charter with a capital stock of $4,000. The incorporators are W. M. Jack, A. M. Creel and L. J. Mohon.

The Hampton Light & Power Company, of Hampton, N. J., has been incorporated with a capital stock of $50,000 to construct and operate electric light plants. The incorporators are John A. Power, P. L. E. Del Fungo Giera and E. P. Baylor.

The Seymour & White Heat, Light & Power Company, of Champaign, Ill., has been incorporated by William Murray, Nevada E. and Orlando S. Murray. The company is capitalized at $2,500 and proposes to generate and distribute electricity for lamps, heaters and motors.

The Terra Alta Lighting Company, of Terra Alta, W. Va., has been incorporated by W. F. Patterson, H. C. Adamson, A. J. Dye and others. The company is capitalized at $23,000, and proposes to install and operate an electric-lighting plant in Terra Alta. The main office of the company is in Waynesboro, Pa.

New Industrial Companies

The New York Electrc Lamp Company, of New York, N. Y., has been incorporated by H. E. Hoyt, F. M. Ekstrom and E. W. Boyce, 38 Park Row, New York, N. Y. The company proposes to manufacture and deal in lamps, appliances, machinery, etc.

The Duzets Company, of New York, N. Y., has been incorporated with a capital stock of $5,000 by C. S. Ashley, H. J. Neuschafer and R. A. Koontz, 295 Broadway, New York. The company proposes to deal in machinery and power plant appliances.

The Allentown Electrical Devices Company, of Allentown, Pa., has been organized for the purpose of manufacturing self-starters, magnetos, coils, vibrators, motors, etc. The company is established at 524 Hamilton Street, Allentown. A. T. Kleintop is manager.

The Sign Advertising Company, of Geneva, N. Y., has been incorporated with a capital stock of $60,000 by H. A. Wheat, M. B. Patch and W. S. Fallon, of Newark, N. Y. The company proposes to manufacture and deal in electrical signs for advertising purposes, metal construction, etc.

The Raymond Construction Company, of New York, N. Y., has been granted a charter with a capital stock of $25,000 for the purpose of doing a general contracting business, electrical work, etc. The incorporators are R. C. Birkman, M. Raymond and B. Epstein, 79 Fifth Avenue, New York, N. Y.

The Sibley-Pittman Electric Corporation, of New York, N. Y., has been incorporated by E. E. Latham, of Dunellen, N. J.; W. M. Deming, of Schenectady, N. Y., and T. M. Debevoise, of Summit, N. J. The company proposes to manufacture and deal in electrical apparatus, machinery, appliances, autos, engines, etc.

The William Gordon Corporation, of New York, N. Y., has been incorporated by W. B. Hofstadter, D. Haar and S. Michael Cohen, 507 West 112th Street, New York, N. Y. The company is capitalized at $30,000 and proposes to do a general contracting business, electrical work, and deal in chandeliers, electrical and plumbers' supplies.

The Christiana Machine Company, of New York, N. Y., has been incorporated with a capital stock of $5,000 for the purpose of manufacturing and dealing in engines, machinery, electrical appliances, hardware and engineering supplies. The incorporators are J. H. MacLaughlan and H. M. L. B. Behre, 127 Duane Street, New York, N. Y.

Trade Publications

Oil Filters.—The Richardson-Phenix Company, Milwaukee, Wis., has issued Bulletin No. 10, which describes oil filters and auxiliary apparatus for central oiling systems.

Refillable Fuses.—The A. F. Daum Company, Pittsburgh, Pa., is sending out a leaflet which contains information on its improved type D and type E refillable fuses.

Reactors.—The Metropolitan Engineering Company, 1250 Atlantic Avenue, Brooklyn, N. Y., has issued Bulletin Section 14-A on the use of reactors and their characteristics.

Lighting Fixtures.—Catalog No. 19, issued by the New York Gas & Electric Appliance Company, 569 Broadway, New York, lists a large number of lighting fixtures.

Spark-Plug Connector.—The Fahnestock Electric Company, 129 Patchen Avenue, Brooklyn, N. Y., has issued a leaflet describing a recently developed spark-plug connector.

Electric Dishwasher.—The Domestic Utilities Company, Newark, N. J., has prepared a booklet which describes an electrically operated dishwashing machine for household use.

Small Electric Range.—The Hughes Electric Heating Company, Chicago, Ill., has prepared a leaflet which describes a small range designed for use in teaching the young how to cook.

Incandescent-Lamp Fixtures.—The Peerless Light Company, Peerless Building, Chicago, Ill., has prepared Bulletin No. 520, which describes and illustrates an adjustable device for incandescent lamps.

Transformers.—The Moloney Electric Company, St. Louis, Mo., has recently brought out Catalog No. 150 on various types of transformers. The catalog is illustrated and contains forty-eight pages.

Electric Centrifuge.—A leaflet describing and illustrating an electrically operated centrifuge for testing blood has been issued by the Shelton Electric Company, 30 East Forty-second Street, New York.

Vacuum-Cleaning Apparatus.—The Spencer Turbine Cleaner Company, Hartford, Conn., has issued several attractively illustrated catalogs and booklets which describe its stationary vacuum cleaners.

Starting Device.—The Condit Electrical Manufacturing Company, Boston, Mass., has recently published Bulletin No. 409, which contains information on its oil switch for use in starting small induction motors.

Electric Welding Apparatus.—Bulletin No. 48,904, entitled "Electric Arc Welding," and Bulletin No. 48,905, entitled "Arc-Welding Apparatus," have just been published by the General Electric Company, Schenectady, N. Y.

Electric Vibrator and Hair Drier.—The Shelton Electric Company, 30 East Forty-second Street, New York, is sending out a folder and booklet which describes several types of electrically operated vibrators and hair driers.

Bedpost Incandescent-Lamp Fixtures.—The Pittsburgh Lamp, Brass & Glass Company, Pittsburgh, Pa., has prepared a leaflet which contains information on an adjustable device for attaching incandescent lamps to bedposts.

Decorative Lighting Fixtures.—The Beardslee Chandelier Manufacturing Company, Chicago, Ill., has issued plates C-5-1 to C-5-6 inclusive, which contain information on and illustrations of various types of decorative lighting fixtures.

Tungsten-Lamp Fixtures.—Various types of fixtures for use with tungsten lamps are described and illustrated in Catalog No. 137, issued by the Adams-Bagnall Electric Company, Cleveland, Ohio. Section 1 of Catalog 138, published by the same company, is devoted to fixtures for series street lighting and Section 2 to constant-current transformers and series panelboards.

Electrical Apparatus.—The Western Electric Company, New York, has recently issued folders on adjustable telephone brackets, construction tools and supplies for pole lines, Hughes No. 17 electric range, Klaxon fire alarms, rural telephones, cable terminals, and unit-type switchboard. The company has also just published a booklet entitled "The Abandoned Bridge," which contains information on exchange switchboards.

Construction News

New England

VINAL HAVEN, MAINE—The Public Utilities Commission has granted the Vinal Haven El. Co. permission to issue $30,000 in capital stock and $30,000 in bonds, the proceeds to be used for acquisition of property and franchises and construction of plant. Contracts for equipment have been placed and construction of plant is under way.

WARREN, N. H.—The Warren Wtr. & Lt. Co., which recently purchased the J. H. Merrill privilege, will erect a power house there. The company has completed the transmission line between Warren and West Warren.

WHITE RIVER JUNCTION, N. H.—Within the next two months the Mascoma El. Lt. & Gas Co., of White River Junction, expects to purchase a car load of 30-ft. and 35-ft. cedar or chestnut poles. Frank Collins is manager.

ST. ALBANS, VT.—The Vermont Pwr. & Mfg. Co., of St. Albans, is contemplating making a change in one of its hydraulic turbines, increasing the capacity from 750 hp to 1000 hp, which will probably be done this summer. W. H. Vorce is treasurer and general manager.

BOSTON, MASS.—Bids will be received by the Schoolhouse Commissioners of the city of Boston, Room 1009, City Hall, Boston, until April 27 for furnishing material for electrical batteries for bells, telephone and clocks. Bids will also be received at the same time and place for furnishing circuit-battery material for fire-alarm systems.

LYNN, MASS.—The Lynn Gas & El. Co. has applied to the State Gas and Electric Light Commission for permission to issue 6000 additional shares of capital stock to be sold to present holders at $240 per share, the proceeds to be used for improvements and extensions to electric and gas systems.

NEW BRITAIN, CONN.—The City Council has adopted a resolution to submit the proposal to establish a municipal electric-light plant to the voters.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 4 for furnishing at the navy yard, Brooklyn, the following supplies: Roller bearings, furnishing and installing indicators, sounding machines, sterilizing outfit, copper pipe, prismatic reflectors, lighting and power wire, etc. Application for proposals should be made to the Navy Pay Office, New York, or to the above bureau.

BUFFALO, N. Y.—The Board of Aldermen has adopted a resolution authorizing the installation of magnetite lamps on Main Street from North Street to the city line as soon as funds are available.

CHAUMONT, N. Y.—The Northern New York Utilities Co., of Watertown, has secured a 90-day option on the property of the Chaumont El. Lt. Co. If taken over, it is expected that the company will close down the local plant and supply electricity here from its plant on the Beaver River.

CONSTABLEVILLE, N. Y.—Plans are being considered for the installation of an electric-lighting system in Constableville.

HILTON, N. Y.—The Rochester Ry. & Lt. Co., of Rochester, expects to erect an electric transmission line from Charlotte to Hilton, a distance of about 10 miles, to supply electricity to the Hilton El. Lt., Pwr. & Ht. Co., under a ten-year contract. Within the next two months the Hilton El. Lt., Pwr. & Ht. Co. expects to purchase transformers, poles, lightning arresters, insulators, wire and meters; also switchboard equipment. J. E. Cooper is president and manager.

HUDSON, N. Y.—The Albany Southern R. R. Co., of Hudson, has applied to the Public Service Commission to erect electric transmission lines in the town of Poestenkill and for approval of the exercise of franchise to supply electricity in that town. Also for authority to erect a distributing system in the town of North Greenbush to supply electrical service there and for approval of a franchise.

NEW YORK, N. Y.—The contract for the construction of Section 4 of Routes 4 and 36 (Seventh Avenue from Fifty-first to Fifty-ninth Street) of the subway has been awarded to the Litchfield Construction Co., for $1,937,509.

NEW YORK, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Park Avenue and Fifty-ninth Street, New York, until May 3 for installing electric equipment in the addition to and alterations in Public School 12, corner of Benson and Frisby Avenues, Westchester, borough of the Bronx. Blank forms, plans and specifications may be obtained or seen at the office of the superintendent.

PORT JEFFERSON, N. Y.—The North Shore El. Lt. & Pwr. Co., of Port Jefferson, has applied to the Public Service Commission for approval of franchise from the village of Shoreham, town of Brookhaven, and for authority to issue $38,000 in bonds for new construction under trust mortgage, heretofore approved.

HANOVER, PA.—The controlling interest in the Hanover & McSherrystown St. Ry. Co. has been sold to interests connected with Brooks & Co., of Scranton. The sale carries with it the property of the Hanover Lt., Ht. & Pwr. Co. James A. Linen, Jr., of Scranton, is president of the new company.

NEW CASTLE, PA.—Plans have been prepared for the construction of a large three-story building on West Washington Street, New Castle, for the Mahoning & Shenango Valley Ry. Co., which will be used as a combination freight and passenger station and also for a large substation, to cost about $65,000. When completed the present electric plant near the Erie tracks will be closed down.

PHILADELPHIA, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 17 for installing a new conduit and wiring system and lighting fixtures at the United States custom house at Philadelphia, Pa. For details see proposals columns.

READING, PA.—Work will soon be started upon the proposed improvements contemplated by the Reading Transit & Lt. Co., involving an expenditure of about $165,000.

CLINTON, N. J.—Bids will be received by the board of managers of the Reformatory for Women, No. 1 Newark Street, Hoboken, until May 10 for construction of reception cottage for the New Jersey State Reformatory for Women at Clinton. Separate bids to be submitted on plumbing, heating and electrical work. Plans and specifications are on file in the office of the Commission of Charities and Corrections, State House, Trenton.

SNAKE HILL, N. J. (not a post office).—The Assembly bill authorizing the Hudson County freeholders to build a power house at Snake Hill and to issue bonds to pay for building and equipment has been signed by Governor Fielder. It is proposed to install an electric generating plant to provide light and heat for the institutions at Snake Hill.

MOUNT AIRY, MD.—Contracts have been awarded by the Mount Airy Ice & El. Co. for equipment for its electric-lighting plant, which includes one 80-hp Nagle return boiler, one 75-hp Ames engine, one 35-kw, three-phase, 60-cycle, alternating-current Burke generator, switchboard equipment, etc. The distributing system will consist of 6 miles of No. 6 and 8 miles of No. 8 B. & S. copper wire and 150 chestnut poles. Forty series street lamps of 60 cp will be installed. C. C. Riddlemoser, of Mount Airy, is general manager.

CHARLOTTESVILLE, VA.—Within the next four months the Charlottesville & Albemarle Ry. Co. expects to erect an office building with substation in rear. It also expects to purchase within the next two months one 200-kw rotary converter and material for 20 miles of 22,000-volt transmission lines. John L. Livers is vice-president and manager.

STAUNTON, VA.—Within the next three months the Staunton Ltg. Co. expects to install a 1250-kw turbine and condenser. W. F. Ficklen, Jr., is superintendent.

WASHINGTON, D. C.—Bids will be received by the Department of Agriculture, addressed to the Chief of the United States Weather Bureau, Department of Agriculture, Washington, D. C., until May 18 for furnishing storm-warning lanterns as specified. For details see proposal columns.

WASHINGTON, D. C.—Bids will be received at the office of the Commissioners of the District of Columbia, District Building, Washington, D. C., until April 26 for furnishing cast-iron posts for use in the electrical department of the city. Specifications may be obtained from the purchasing officer, Room 320, District Building.

North Central

BAY CITY, MICH.—Plans are being prepared for the installation of an ornamental lighting system in Carroll Park by the Bay City Park Commission. The plans provide for the erection of ornamental standards carrying five-lamp clusters maintained by underground wires. The new system will require over 7000 ft. of cable.

BURR OAK, MICH.—Within the next 30 days the United El. Co., of Burr Oak, expects to purchase one high-pressure tubular boiler, 150 lb. pressure; also some poles, transformers, insulators, wire, etc., for a 14,000-volt transmission line, 9 miles long. B. E. Seaver is treasurer.

DETROIT, MICH.—The Police Department has asked the Board of Estimates for an appropriation to install a new signal system of lights and wires. The cost of the first unit of the new signaling system is estimated at $30,000.

DETROIT, MICH.—A large tract of land on Grand Avenue, just beyond the city limits, has been purchased by B. E. Taylor, with offices in the Ford Building, who plans to subdivide the farm into lots. A complete electric-lighting system, it is said, will be installed at once.

GRAND RAPIDS, MICH.—The City Council has adopted the resolution to install 120 additional street lamps throughout the city.

ITHACA, MICH.—Within the next two months the Village Board expects to rebuild part of the outside lines of the municipal electric-light plant and to install one 75-kva generating unit (directly connected), one 150-kva generating unit (belted) and switchboard; generators to be 60 cycles, three-phase, 2300 volts. The contract for the generators and engine has been awarded to the Ridgway Dynamo & Engine Co., of Ridgway, Pa. Some material will be required for distribution and lighting systems. H. E. Churchill is superintendent.

LOWELL, MICH.—The Board of Public Works expects to rebuild the municipal power house (making it fireproof) within the next four months; also to purchase some washing machines, vacuum cleaners, etc. F. J. McMahon is superintendent.

BROOKLYN HEIGHTS (CLEVELAND), OHIO.—Bids will be received by the clerk of the Board of Education of Brooklyn Heights School District, Cleveland, until May 10 for construction of school building, including heating, ventilating apparatus and electric wiring. W. H. Nicklas, Cleveland, is architect.

CLEVELAND, OHIO.—The Building Department has issued a permit for the construction of a power house (to cost $90,000) and necessary tunnels to connect it with the City Hospital group on the Scranton Road.

CLEVELAND, OHIO.—Bonds to the amount of $200,000 have been disposed of which will provide funds for the installation of an ornamental lighting system for the entire central business district. Bids on standards and other equipment, it is understood, will soon be asked for. F. W. Ballard is commissioner of lighting.

CLEVELAND, OHIO—Bids will be received at the office of the commissioner of purchases and supplies, Room 511, City Hall, Cleveland, until April 30 for a 5-ton automobile truck for correction farm, Warrensville. Specifications may be had at the office of the commissioner of charities and correction, Room 209, City Hall.

CLEVELAND, OHIO—Bids will be received at the office of the commissioner of purchases and supplies, Room 511, City Hall, Cleveland, until April 28 for construction of pavilion in Rockefeller Park complete, including electric wiring. Specifications may be obtained at the office of the city architect, Room 420, City Hall.

HAMILTON, OHIO.—Plans have been prepared by the West Side Commercial Association and the Retail Merchants' Association for the extension of the cluster lighting system in that section of the city.

NORWALK, OHIO—The City Board of Control has engaged the H. Whitford Jones Co., consulting engineers, of Cleveland, to prepare plans and supervise the construction of the proposed municipal electric-light plant, for which bonds have been issued.

ST. BERNARD, OHIO.—Within the next six months the Board of Public Service expects to purchase one 500-kw, 60-cycle, 2300-volt electric generating unit (directly connected), and a pump, capacity not yet decided upon; also general supplies for distribution and lighting systems. E. C. Heller is superintendent.

SANDUSKY, OHIO—The Sandusky Gas & El. Co. has applied to the Ohio Public Utilities Commission for authority to issue

$750,000 in bonds, the proceeds to be used to take up $400,000 in old securities and to provide funds for improvements and extensions.

WADSWORTH, OHIO.—The City Council is reported to be considering the purchase of the property of the Wadsworth Lt. & Wtr. Co., at $87,000. The proposition will probably soon be submited to the voters.

WEST MILTON, OHIO—Within the next six months L. A. Pearson, owner of the Stillwater Valley electric-light plant, expects to erect a transmission line (3 miles long) to a nearby town.

HAZARD, KY.—The Hazard Pwr. Co. has closed a contract with the Kentucky-Jewell Coal Co. for electrical power (2300 volts, 60 cycles). The Kentucky-Jewell Coal Co. has purchased a 75-kva Ridgway generating unit (directly connected) to supply the service for the present, but later will install a motor-generator set. L. L. Stone is manager of the Hazard company.

LOUISVILLE, KY.—Specifications calling for 25 motors, aggregating a total of 350 hp, have been issued by the Louisville Bridge & Iron Co., which is changing its system from direct current to alternating current. The company purchases energy to operate its plant.

LOUISVILLE, KY.—Arrangements are being made to equip the entire woodworking plant of Gamble Brothers at Highland Park for electrical operation. The present dynamo will be replaced by a 250-kw General Electric generator and the number of motors will be increased from 10 to 30.

BLUFFTON, IND.—The Board of Commissioners of Wells County is contemplating the installation of an electric-lighting system in the Wells County poorhouse.

BROOKSTOWN, IND.—The installation of an electric-lighting system in Brookstown is under consideration. It is proposed to purchase electricity to operate the system.

FORT WAYNE, IND.—The Board of Works is contemplating the purchase of a new 700-hp high-pressure boiler for the municipal electric-lighting plant. An addition will probably be built to the boiler house. Plans are also being considered to install a lighting system in the Harrison Hill addition.

CHICAGO, ILL.—Bids will be received by John McGillen, clerk of the Sanitary District of Chicago, 700-910 South Michigan Avenue, Chicago, Ill., until April 29 for furnishing 250-kva and 200-kva, 12,000-volt transformers. For details see proposal columns.

GALESBURG, ILL.—The contract for the installation of an ornamental lighting system in the business district has been awarded to H. H. Guenther, of Galesburg, for $9,080.

ROCHESTER, ILL.—The Village Board has granted the Springfield Gas & El. Co., of Springfield, a 20-year franchise to supply electricity in Rochester for commercial purposes and a contract for lighting the streets of the village for a period of 10 years. The company will furnish 20 nitrogen street lamps of 250 cp each. The transmission line will be extended from Tuxhorn to Rochester, a distance of 3 miles.

MADISON, WIS.—The Janesville & Madison Trac. Co. has been granted a permit to build an electric railway from Madison to a point on the other side of Lake Monona, known as the Town Hall of Blooming Grove. This will be a direct-current system and the company proposes to extend its line from time to time this summer. Arrangements for equipment will be made about Aug. 15. G. Prickhardt is president of the company.

CLARISSA, MINN. — Bonds to the amount of $5,000 have been voted for the installation of an electric-lighting system in Clarissa.

ST. CLOUD, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until April 26 for the electrical construction of the power plant for the State Reformatory, St. Paul, in accordance with plans and specifications prepared by the Charles Pillsbury Co., engineer, Metropolitan Building, Minneapolis, Minn.

FORT MADISON, IA.—The Fort Madison El. Co. is erecting a new three-wire distributing system in the west end of the city and wrecking the old two-wire system. Material has been purchased. A. S. Nichols is manager.

IOWA FALLS, IA.—A company has recently been organized in Iowa Falls with a capital stock of $200,000 for the purpose of constructing a new heating and lighting plant. John A. Reed, of Cedar Rapids, is interested in the project.

WAVERLY, IA.—Bids will be received at the office of H. R. Van Derveer, city clerk, Waverly, Ia., until April 27 for the construction of bulkhead and dam across the river at Waverly. Plans and specifications are on file in the office of the city clerk and may be obtained from C. A. Cool, engineer, Waverly, upon deposit of $5.

WEST UNION, IA.—The Turkey River Pwr. Co., of West Union, is planning to erect a transmission line from West Union to Fayette, where the company was recently granted a franchise to supply electrical service.

BRUNSWICK, MO.—The installation of an ornamental lighting system in the business district is under consideration by the Council. L. E. Merrill is city clerk.

JOPLIN, MO.—The Empire District El. Co., of Joplin, is contemplating extending its transmission line to the Granby Mining Camp.

SPRINGER, MO.—The City Council has granted J. S. Bowman a franchise to construct and operate an electric-lighting plant in Springer.

SPRINGFIELD, MO.—The St. Louis & San Francisco Railroad plans to equip three of its railroad shops in Springfield with electrically operated machinery and may possibly install an electric generating plant. The railroad officials are now negotiating with the Federal Lt. & Trac. Co. and the Ozark Pwr. & Wtr. Co. for electrical service.

URICH, MO.—At an election held April 7 the proposal to grant to the Urich El. Lt. & Pwr. Co. a franchise to install and operate an electric-lighting plant was carried. H. Busse, of Urich, is interested in the company.

BELFIELD, N. D.—Bonds to the amount of $20,000 have been voted for the installation of an electric-lighting plant and water-works system.

HITCHCOCK, S. D.—A petition has been presented to the City Council asking that an election be called to submit to the voters the proposal to issue bonds for the purpose of purchasing the local electric-light plant, to be owned and operated by the municipality.

LEIGH, NEB.—At an election held recently bonds to the amount of $10,000 were voted for the installation of an electric-lighting plant in Leigh. Bruce & Standevan, of Omaha, are consulting engineers.

GAYLORD, KAN.—Bonds to the amount of $7,000 have been voted for the installation of a municipal electric-lighting plant in Gaylord. Electricity for operating the system, it is understood, will be obtained from the transmission line to Portis and Downs, Kan.

POMONA, KAN.—Bonds to the amount of $13,000 have been voted for the installation of a municipal electric-lighting plant in Pomona. Energy for operating the system will probably be obtained from Ottawa.

Southern States

BLADENBORO, N. C.—At an election to be held May 4 the proposal to issue $2,000 in bonds for the installation of an electric-lighting system will be submitted to the voters.

GREAT FALLS, S. C.—The Southern Pwr. Co., of Charlotte, N. C., has awarded contract for construction of dam and power house at Fishing Creek, on the Catawba River, 3 miles above the Great Falls plant, to the Hardaway Contracting Co., of Columbus, Ga. The plans call for a 30,000-hp development under a 50-ft. head. The equipment will include five 8000-hp units.

WALTERBORO, S. C.—Bids will be received by the Commission of Public Works, Walterboro, S. C., until May 14 for furnishing material and construction of electric-lighting plant, sewerage and water-works systems as follows: Electric pole-line distribution system, power house for electric plant and pumping station, two 100-hp boilers, one 200-hp feed-water heater with pump, one steam engine for direct connection to generator, one 50-kw alternating-current generating equipment with three-panel switchboard and street-lighting regulator, two 750-gal. per minute steam-driven pumps, one triplex service pump, steam and hydraulic pipe and other auxiliaries, one 100,000-gal. or 75,000-gal. tower and tank, one 150,000-gal. concrete reservoir with concrete cover, one artesian well, approximately 40 fire hydrants, 20 gate valves, and a complete system of sanitary sewers, including approximately 6 miles of pipe sewers from 8 in. to 15 in. in diameter, manholes, flush tanks, etc. Plans and specifications may be seen at the office of H. W. Black, Jr., chairman, and at the office of the H. S. Jaudon Engineering Co., Savannah, Ga.

FELLSMERE, FLA.—The Fellsmere El. Lt. & Ice Co. is contemplating improvements and extensions to its electric-lighting system.

PORT RICHEY, FLA.—The installation of an electric-lighting plant, water-works, sewer system, etc., is under consideration. S. Wessilius, of Grand Rapids, Mich., is reported interested.

BRAEMER, TENN. (not a post office).—Plans are being considered by the Pittsburgh Pwr. Co., 1006 Columbia Bank Bldg., Pittsburgh, Pa., for the construction of a hydroelectric plant on Chuckey River, near Braemer.

MEMPHIS, TENN.—At an election held recently the City Commission was given authority to issue $1,500,000 in bonds for the purchase or erection of a municipal electric-light plant. A special committee will soon be appointed by the Mayor to determine whether the plant of the Memphis Lt. & Pwr. Co., on which the city has an option, shall be purchased, whether a new plant shall be built, or if the plan shall be temporarily or permanently abandoned.

NASHVILLE, TENN.—Plans are being considered by merchants and propety owners of upper Broadway and Eighth Avenue for extension of the ornamental lighting system to that district.

NEWBERN, TENN.—Within the next three months the managers of the municipal electric-lighting plant expect to purchase some electrical appliances, including heating and cooking apparatus, vacuum cleaners, washing machines, etc. J. H. Patterson is superintendent.

BIRMINGHAM, ALA.—The Birmingham Wtr., Lt. & Pwr. Co. is contemplating the construction of a power house at Lock 17 on Warrior River, 30 miles from Birmingham, to develop about 32,000 hp, and the erection of an electric transmission line to Birmingham. The company is also planning to erect transmission lines to Bessemer and to secure a franchise in North Birmingham. It also has a contract from the federal government to supply electricity to operate lock gates at Lock 17 and has been granted permission to construct power plant. The company will purchase electricity from the Alabama Pwr. Co. until new plant is completed.

BENTONVILLE, ARK.—The City Council has engaged Albert C. Moore, consulting engineer, of Joplin, Mo., to make investigation and prepare estimates of the cost of extending and improving the municipal electric-lighting plant and water-works system.

MOUNTAIN HOME, ARK.—Application has been made to the City Council by K. V. Loba and Dillon Underhill for a franchise to install and operate an electric-lighting plant in Mountain Home.

PRAIRIE GROVE, ARK.—The Prairie Grove El. Co., recently incorporated, is planning to install an electric plant in Prairie Grove. The present plans provide for the installation of two oil engines and one 50-kva, three-phase, 2300-volt generator (belted), automatic oil switch and three 7½-kva transformers. The street-lighting system will consist of ten 100-watt nitrogen multiple lamps and thirty 60-watt multiple tungsten lamps, 175 25-ft. W. C. poles will be used and 75 5-amp alternating-current meters. It is proposed to establish a 24-hour service from the start. No orders have yet been placed for machinery or equipment. It is expected to have the plant in operation by July 1, 1915. J. H. Zellner is president; Mack Thompson, of Prairie Grove, is engineer in charge.

VINTON, LA.—The Vinton Wtr., Lt. & Pwr. Co., recently organized with a capital stock of $35,000, has awarded contract for construction of electric-light plant and ice factory to the Neches El. Co., of Beaumont, Tex., for $25,000.

ALTUS, OKLA.—Plans are being considered for extensions and improvements to the municipal electric-lighting plant.

MARSHALL, OKLA.—The City Council has engaged the Benham Engineering Co., of Oklahoma City, Okla., consulting engineers, to make investigations, prepare plans and supervise the construction of the proposed municipal electric-light plant and water-works system. An election will soon be called to submit the proposal to issue $25,000 in bonds to provide funds for the above work.

ARANSAS PASS, TEX.—Bonds to the amount of $35,000 have been sold, the proceeds to be used for the installation of an electric-light plant and water-works system.

BEEVILLE, TEX.—Within the next 10 days the Texas Southern Pwr. Co., of Beeville, expects to purchase one 18-ft. by 72-in. Erie return-tubular boiler (150 lb. pressure). F. C. Green is manager.

BOERNE, TEX.—The electric plant of the Boerne El. Pwr. & Mfg. Co. has been purchased by Calvin North, who will overhaul and rebuild the plant.

BROWNSVILLE, TEX. — Within the next two months the city of Brownsville expects to purchase one 350-kva generator and engine (probably turbine) for the municipal electric-light plant, and to erect within the next three months 75 ornamental street lamps and 100 series street lamps on 4 miles of wire. F. H. Williams is superintendent.

BURKBURNETT, TEX.—The City Council is reported to have closed a contract for the installation of an electric-lighting system in Burkburnett.

CAMERON, TEX.—The Cameron Wtr., Pwr. & Lt. Co. expects to install by July 1 one 500-hp Allis-Chalmers Diesel oil engine and generator with switchboard. C. W. Lawrence is secretary.

CHILDRESS, TEX.—The Childress Ice & Lt. Co. is installing an 86-hp Ball engine and also expects to purchase "hot-point" irons and miscellaneous electrical appliances, etc. E. T. Thomas is manager.

FLORESVILLE, TEX.—The Floresville Lt. & Pwr. Co., recently organized, is installing an electric-light plant in Floresville. The equipment will consist of two generators, one 50 kw and the other 75 kw (the latter has not yet been purchased), and two oil engines (only one purchased). The company would like to receive prices on one oil engine from 75 hp to 100 hp. Switchboard, transformers, overhead-line material, etc., have been purchased. W. M. Pittman is engineer in charge.

HARROLD, TEX.—The Commercial Club is promoting the construction of an electric-light and power plant in Harrold.

LOCKNEY, TEX.—The Malone Lt. & Ice Co., of Plainview, which recently purchased the electric plant of the Lockney Lt. & Pwr. Co., it is understood, will enlarge and improve the plant.

LONGVIEW, TEX.—The property of the Longview Ice & Lt. Co. has been purchased by the American Pub. Ser. Corpn., of New York, N. Y. The new company, it is understood, will make improvements to the system.

LUBBOCK, TEX.—Improvements including the installation of new machinery are contemplated to the plant of the Lubbock Lt. & Ice Co., which was recently purchased by the Malone Lt. & Ice Co., of Plainview.

LULING, TEX.—The City Council, it is reported, is negotiating with the Texas Pwr. & Lt. Co., of Dallas, relative to supplying electricity in Luling.

SEGUIN, TEX.—Extensions and improvements, it is reported, are contemplated to the municipal electric-light plant and water-works system. Owen A. Goffard is manager.

SPRINGTOWN, TEX.—The Fort Worth Pwr. & Lt. Co., of Fort Worth, is contemplating the installation of an electric-lighting system and ice plant in Springtown.

THRALL, TEX.—The Texas Pwr. & Lt. Co., of Dallas, is planning to erect a high-tension transmission line to connect Taylor, Thrall, Rockdale and Cameron with its central station at Waco.

Pacific States

ALBION, WASH.—The Washington Wtr. Pwr. Co., of Spokane, is negotiating with the City Council for a franchise in Albion and a contract for street lighting. If granted a franchise the company will extend its transmission lines from Pullman and will also supply electrical service to farmers residing along the line.

CHELAN, WASH.—The Great Northern Ry. Co., it is reported, will build a temporary power plant near Chelan this spring, which will furnish power for pumping water for irrigation purposes and will also be used by the railroad company in connection with the construction of its large power dam on Lake Chelan.

MOCLIPS, WASH.—Application has been made to the Commissioners of Chehalis County by the M. R. Smythe Shingle Co., of Moclips, for a franchise to erect electric transmission lines along certain roads and streets in the county in and around this city. The company, it is understood, contemplates the installation of an electric-lighting system in Moclips.

MONTESANO, WASH.—The Northwest El. & Water Wks., of Montesano, has been granted a franchise to erect its transmission lines from South Montesano to Montesano. The company is building a steam power plant in South Montesano, at a cost of $20,000.

NORTH YAKIMA, WASH.—The Pacific Pwr. & Lt. Co., of North Yakima, has applied to the Commissioners of York County for a 50-year franchise to extend its transmission line in the Moxee Valley, a distance of 3 miles, and for ½ mile near the Naches power station. The later extension is to furnish electricity to a pumping plant being built by W. R. Rowe, and the Moxee extensions are to meet the demands of farmers for electrical service.

SEATTLE, WASH.—The contract for the construction of a power plant at the Government Canal at Lake Washington has been awarded to R. D. Wood & Co., of Philadelphia, Pa., at $31,776.

SEATTLE, WASH.—J. D. Ross, superintendent of lighting, has recommended to the Council and Mayor Gill the construction of an addition to the Lake Union municipal auxiliary steam plant, increasing its rating from 10,000 kw to 20,000 kw. Anticipating that it will require considerable time to make the new masonry dam at Cedar Falls available for power purposes, Superintendent Ross states that a new means must soon be supplied to take care of the increasing demand for electricity. If the Council approves the proposed plan, a bond issue will be submitted to the voters.

BEND, ORE.—The City Council has passed an ordinance granting the Bend Flour Mill Co. a franchise to install and operate an electric-lighting system in Bend over the veto of Mayor Miller.

LEBANON, ORE.—The Lebanon El. Lt. & Wtr. Co. is contemplating the construction of a new power house and concrete dam; also the installation of three 400-kva, 4000-volt vertical generators, of which only one will be installed this year. S. I. Stewart is manager.

LOS ANGELES, CAL.—The proposal to install ornamental lamps in Culver City, a suburb of Los Angeles, will soon be submitted to the voters. The district to be lighted includes Culver City, the new 200-acre subdivision known as greater Culver City, and about 2 miles along the Washington Boulevard, including the settlement east of Culver City. The project calls for about 500 electroliers. A similar movement is reported to be under way at The Palms.

MERCED FALLS, CAL.—The San Joaquin Lt. & Pwr. Corpn., of Fresno, is contemplating the construction of a new 1000-kw generating plant at Merced Falls, to cost about $75,000. The company is also planning the erection of several transmission lines, one of which will be erected this season. The transmission line extending from Merced to Merced Falls will be rebuilt and the voltage raised from 30,000 to 60,000. The company plans ultimately to extend the line from Merced to Los Banos and also to erect a line from Raymond to Merced. The dams have already been completed and bids are now being received on material for plant.

SANTA CRUZ, CAL.—The Coast Counties Gas & El. Co., of Santa Cruz, has applied to the State Railroad Commission for permission to issue 1000 shares of capital at 90, the proceeds to be used for extension of service.

DUCHESNE, UTAH.—The City Council has granted John R. Glenn, Marcellus Pope, of Vernal, and R. W. Kroupa, of Duchesne, a franchise to construct and operate an electric-light plant in Duchesne. The cost of the plant is estimated at about $10,000. The company will also supply electricity in the surrounding country.

PLEASANT GROVE, UTAH.—The town of Pleasant Grove has filed application on 10 second-ft. of water to be taken from Grove Creek and utilized for power purposes. The water will be conveyed to the power plant by a pipe line 8860 ft. long. The proposed plant will be owned and operated by the municipality and will furnish electrical service in Pleasant Grove and vicinity.

BUFFALO, WYO.—Improvements and extensions are contemplated by the Buffalo Mfg. Co. this spring to its plant, involving an expenditure of about $25,000. A dam site has been purchased in Clear Creek Canyon, where a dam will be constructed The power plant will be moved up the stream about 4 miles. Water will be conveyed from the dam to the waterwheel, a distance of about 8000 ft.

COKEVILLE, WYO.—A site for the proposed power plant that is to be built in City Creek Canyon to furnish electricity in Cokeville has been selected by Charles O'Connor and W. H. Dingboom. The plant will be located about 5 miles from town.

GRANGER, WYO.—The City Council, it is reported, is securing plans and estimates of costs for the installation of a municipal electric-light plant in Granger.

MOORCROFT, WYO.—The Town Council has decided to submit the proposal to issue bonds for the installation of an electric-lighting system to the voters at the regular spring election.

SARATOGA, WYO.—The Saratoga Lt., Ht. & Pwr. Co. has recently completed the installation of a new plant. The equipment consists of two Fairbanks-Morse (type Y) oil engines, of 25 hp each; one 30-kw General Electric alternating-current generator and one 15-kva Fairbanks-Morse three-phase alternating-current generator. D. E. Winsor is general manager.

GOLDEN, COL.—Preliminary plans are under way by the Jefferson Pwr. Co. for the construction of a power plant in Golden. J. E. Phinney is president and J. O. Hodley is superintendent of the company.

FORT SUMNER, N. M.—A company has been organized for the purpose of establishing a water, light and power plant in Fort Sumner.

Canada

BLENHEIM, ONT.—Estimates have been submitted to the Town Council by the Hydro-Electric Commission engineers for the installation of hydroelectric power in Blenheim, placing the cost at a little over $16,000, with allowances made for part of the old plant that might be used, estimated at a little over $2,000. They recommend that a by-law authorizing $14,000 be submitted to the ratepayers.

HAMILTON, ONT.—Tenders will be received by S. H. Kent, city clerk, addressed to Chester S. Walters, Mayor, chairman of Board of Control, Hamilton, Ont., until April 27 for the following: One centrifugal pump for pumping raw sewage, capacity 8,000,000 imperial gal. per 24 hours; one 150-hp synchronous motor with switching apparatus and all accessories, complete, for direct connection to centrifugal pump. Specifications may be obtained upon application to the office of the city engineer, where tender forms may be obtained.

OTTAWA, ONT.—Bids will be received by the chairman and members of the water-works committee, Ottawa, until May 12 for furnishing and erecting one electrically operated pumping unit. Specifications and full particulars may be obtained on application to the city engineer's office, City Hall, Ottawa. R. L. Haycock, acting water-works engineer.

RIDGETOWN, ONT.—The Town Council has decided to submit a by-law to the ratepayers calling for the installation of a hydroelectric power to operate the municipal electric system.

ST. MARYS, ONT.—The Water, Light and Heat Commission has asked the Town Council to pass a by-law appropriating $12,500 for the installation of a new street-lighting system and to purchase a gasoline engine for the municipal power plant.

HEMMINGFORD, QUE.—The Hemmingford Lt., Ht. & Pwr. Co. has awarded the contract for construction of electric plant to J. A. Freeman, of Plattsburgh, N. Y. Energy for operating the system will be secured from Knopp & Son, of Mooers, N. Y. G. W. Keddy is interested in the Hemmingford company.

Miscellaneous

JUNEAU, ALASKA.—John Rustgard, local attorney, represents a company which proposes to install an electric-light and power plant in Juneau to furnish electrical service in this city and contiguous territory.

HONOLULU, HAWAII—A resolution has been adopted by the Supervisors providing for the appropriation of $34,000 for the installation of an electric-light plant and police-signal system.

PANAMA—Bids will be received at the office of the purchasing officer, the Panama Canal, Washington, D. C., until May 1, for furnishing steel plates, angles, channel and I-beams, soft steel bars, bolts, rivets, steel wire, brass wire, electric cable, bar copper, bronze bars, plate zinc, twist drills, bits, files, engine lubricators, etc. Blanks and general information relating to this circular (No. 917) may be obtained from the above office or the office of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.

ST. JOHNS, N. F.—Announcement has been made of the registration by Thomas Leopold Wilson, an inventor and capitalist of Ottawa, Ont., of a company, capitalized at $20,000,000, organized for the purpose of developing electrical energy for the manufacture of fertilizers in this colony. Mr. Wilson has secured from the colonial government a concession of large areas of land on the west coast for the project.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED APRIL 13, 1915.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,134,995. ELECTRICAL HEATER; F. J. Cook, Cleveland, Ohio. App. filed July 21, 1913. Automobile foot-rest foot warmer.

1,134,996. ANNUNCIATOR DROP; S. H. Couch and W. W. Henry, Wollaston, and A. E. Stevens, Atlantic, Mass. App. filed July 8, 1911. For selective ringing and announcing systems.

1,135,010. CARTRIDGE FUSE; W. T. Garlitz and W. R. Gardner, McKee's Rock, Pa. App. filed March 27, 1914. Special quick clamp for the fuse link.

1,135,011. TELEPHONE SYSTEM AND APPARATUS; C. L. Goodrun, Rochester, N. Y. App. filed April 1, 1905. Simplified automatic system.

1,135,014. POSITION INDICATOR FOR ELEVATORS; G. Harding, Spokane, Wash. App. filed Dec. 15, 1913. Indicates in one elevator the position of the adjoining elevator.

1,135,016. MAGNETIC SEPARATOR; J. L. Hiller, Mattapoisett, Mass. App. filed Dec. 24, 1909. For separating magnetic material from coal on its way to the crusher.

1,135,040. ELECTRIC SIGNALING APPARATUS; E. G. Missbach, New York, N. Y. App. filed June 28, 1912. Embodying cipher dials at the sending and receiving stations.

1,135,048. WARNING SIGNAL; A. N. Pierman, Newark, N. J. App. filed Dec. 2, 1912. Bulb for operating reed horn; has switch for sounding electric horn.

1,135,049. ELECTRIC-LANTERN ATTACHMENT; N. S. Richmond, Chicago, Ill. App. filed March 30, 1914. For mounting on a dry cell.

1,135,103. COOLING SYSTEM FOR TRANSFORMERS; C. Le G. Fortescue, Wilkinsburg, Pa. App. filed Nov. 6, 1908. Fluid-circulating means.

1,135,121. TELEPHONE EXCHANGE; F. A. Lundquist, Chicago, Ill. App. filed May 23, 1903. Automatic. (Seventy-two claims.)

1,135,129. ARC LAMP; H. E. Moul, London, Eng. App. filed Jan. 21, 1909. Has converging carbon electrodes.

1,135,130. PROTECTIVE SWITCH BOX; T. E. Murray, New York, N. Y. App. filed Jan. 13, 1914. Circuit broken by opening of box.

1,135,138. SNAP-SWITCH BASE; W. H. Platt, Hartford, Conn. App. filed Oct. 28, 1914. Has special bearing for the switch spindle.

1,135,154. PROCESS OF REMOVING CARBON FROM PRESSED BODIES OR TUNGSTEN; F. Blau, Berlin, Germany. App. filed Aug. 3, 1906. Heats in an atmosphere of nitrogen and hydrogen.

1,135,182. METHOD OF PRODUCING HEAT-RESISTING BODIES; P. R. Hershman, Chicago, Ill. App. filed Oct. 12, 1914. Furnace lining manufactured from aluminum waste products.

1,135,193. CAP FOR LAMP SOCKETS AND THE LIKE; C. J. Klein, Milwaukee, Wis. App. filed April 8, 1912. Cap of solid insulation with metallic fastenings.

1,135,194. INSULATING MEANS FOR LAMP SOCKETS AND THE LIKE; C. J. Klein, Milwaukee, Wis. App. filed March 17, 1913. Cap lining secured to the socket base.

1,135,195. DEVICE FOR PREHEATING HYDROCARBONS IN CARBURETORS; R. E. Krause, Detroit, Mich. App. filed Jan. 4, 1913. Heating plug screwed into float chamber of carburetor.

1,135,199. ELECTRIC SWITCH; A. E. J. Maage, Milwaukee, Wis. App. filed March 24, 1910. Pull-socket construction.

1,135,201. MAGNETIC SWITCH; J. F. McElroy, Albany, N. Y. App. filed Nov. 14, 1911. Thermostat controller for electric car heaters.

1,135,206. PLUG-AND-SOCKET CONNECTOR; J. Sachs, Hartford, Conn. App. filed Aug. 30, 1912. Two-part attachment plug.

1,135,225. RAILWAY BLOCK SYSTEM; R. E. Thompson, New York, N. Y. App. filed Feb. 7, 1912. Train-stopping system employing a third-rail. (Forty-nine claims.)

1,135,285. CIRCUIT CONTROLLER; F. R. Hoyt, Indianapolis, Ind. App. filed Oct. 24, 1910. Automobile lighting system. (Sixty-two claims.)

1,135,297. KEY FOR STOP BOXES; O. J. La Combe, Jr., Negaunee, Mich. App. filed May 8, 1914. Carries a lamp to assist in placing it.

1,135,308. ILLUMINATED SIGN; C. A. McNeil, Columbus, Ohio. App. filed May 17, 1911. Has a pattern sheet which determines the lighting of the lamps in a predetermined design.

1,135,311. AUTOMATIC SWITCH FOR CONTROLLING LIGHTS; L. A. Meyers, Sauk Center, Minn. App. filed March 14, 1914. For lighting a closet lamp when closet door is opened.

1,135,321. SELECTIVE ELECTRICAL SIGNALING; L. M. Potts, Baltimore, Md. App. filed May 7, 1910. Uses synchronizing impulses.

1,135,322. TRANSMITTING APPARATUS FOR ELECTRICAL SIGNALING; L. M. Potts, Baltimore, Md. App. filed May 7, 1910. Has a mechanically operated transmitting contact.

1,135,327. DYNAMO-ELECTRIC MACHINE; M. A. Savage, Schenectady, N. Y. App. filed June 24, 1913. Turbo-generator with water-cooled armature.

1,135,344. PRINTING-TELEGRAPH ALPHABET; C. G. Ashley, Chicago, Ill. App. filed June 20, 1911. Directly readable roman alphabet.

1,135,358. CUT-OUT BOX; R. C. Cole, Hartford, Conn. App. filed March 17, 1914. Main-line type; circuit broken when box is opened.

1,135,374. MECHANISM FOR TRAIN-CONTROL SYSTEMS; G. B. Gray, Pittsburgh, Pa. App. filed May 16, 1912. Polarity reverser.

1,135,376. UNION FOR CONNECTING ELECTRIC CABLES TO SUBWAY OR JUNCTION BOXES; D. C. Hooker, Farmington, Conn. App. filed June 20, 1914. Cable union bell.

1,135,384. CIRCUIT-CONTROLLING APPARATUS FOR TRAIN-LIGHTING SYSTEMS; E. H. M. Langley and E. W. Price, Aston, Birmingham, England. App. filed May 6, 1911. Change-over switch.

1,135,389. MAGNETIC FLATIRON; J. W. Moore, Fort Edward, N. Y. App. filed Sept. 23, 1913. The electromagnet coils serve also to heat the iron.

1,135,393. TRANSMITTER FOR WRITING TELEGRAMS AND THE LIKE; A. Rappenecker, Bremen, Germany. App. filed Oct. 27, 1913. Pivotally mounted pencil-lever construction.

1,135,412. CONTROL APPARATUS; N. W. Storer, Pittsburgh, Pa. App. filed Sept. 4, 1913. Liquid rheostat.

1,135,427. SIGNALING SYSTEM; C. E. Beach, Binghamton, N. Y. App. filed May 16, 1914. Live wires maintained under constant test.

1,135,436. TELEPHONOGRAPH; E. Chabeault, Marseilles, France. App. filed Feb. 10, 1913. Amplifying microphonic listener.

1,135,438. ELECTRICAL RELAY; A. W. Copley, Wilkinsburg, Pa. App. filed July 24, 1912. For regulating voltage or other quantity of alternating-current circuit.

1,135,473. COOKING APPARATUS; F. A. Vath, Chicago, Ill. App. filed Aug. 4, 1913. Electric fireless-cooker principle.

1,135,487. SIGNALING SYSTEM; E. E. Backus, Chicago, Ill. App. filed April 28, 1913. Concentration type.

1,135,494. END-CELL REGULATOR; W. L. Bliss, Brooklyn, N. Y. App. filed May 9, 1907. For car-lighting system.

1,135,499. STORAGE-BATTERY PLATE; A. L. Chamberlin, Des Moines, Ia. App. filed May 31, 1911. For autos; special provision for retaining the active material in the grid.

1,135,539. ELECTRIC SEAM-WELDING APPARATUS; R. Mack, Berlin, Germany. App. filed Sept. 17, 1912. Brushes conduct energy and a hardened non-conducting steel pressure roller is employed.

1,135,541. GLOW-LAMP FIXTURE; T. E. Murray and G. K. Jessup, New York, N. Y. App. filed March 28, 1914. Key-socket structure.

1,135,548. FUSE DEVICE; E. O. Echweitzer and N. J. Conrad, Chicago, Ill. App. filed April 18, 1912. Projects stream of insulating liquid into arc space.

1,135,580. BATTERY CONNECTOR AND RECEPTACLE; C. H. Harris, Keokuk, Ia. App. filed April 15, 1914. Takes any standard type of dry cells.

1,135,596. DOUBLE GEAR FOR CONTROLLING ELECTRICALLY AND BY HAND DEVICES PLACED AT A DISTANCE; V. Locarni, Cornigliano, Italy. App. filed Feb. 14, 1913. Ship-steering apparatus.

1,135,600. WARNING SIGNAL DEVICE; R. H. Manson, Elyria, Ohio. App. filed July 30, 1914. Diaphragm vibrating wheel is located on the motor shaft between armature and commutator.

1,135,604. PROCESS AND APPARATUS FOR DETERMINING THE POSITION OF RADIO-TELEGRAPHIC RECEIVERS; A. Meissner, Berlin, Germany. App. filed Aug. 2, 1912. Determines the directions from which the signals arrive.

1,135,605. MEANS FOR CONTROLLING THE ILLUMINATION OF VEHICLES; W. S. Menden, Brooklyn, N. Y. App. filed Dec. 2, 1913. Throws lights on and off as train enters underground section or emerges therefrom.

1,135,608. CURRENT-CONTROLLING DEVICE; H. N. Ott, Buffalo, N. Y. App. filed May 24, 1913. Rheostat.

1,135,613. SYSTEM OF OPERATING TYPEWRITERS AND THE LIKE; L. M. Potts, Baltimore, Md. App. filed Jan. 16, 1911. Any machine in the system can be operated from the keyboard of any other machine in the system.

1,135,614. TELEGRAPHY; L. M. Potts, Baltimore, Md. App. filed Aug. 6, 1912. Looped wire from central office to subscriber.

1,135,624. ELECTRICAL TELESCOPY; B. Rosing, St. Petersburg, Russia. App. filed April 5, 1911. Embodies revolving sets of mirrors.

1,135,643. PARTY-LINE TELEPHONE SYSTEMS; B. D. Willis, Chicago, Ill. App. filed Nov. 13, 1906. Prevents interference in automatic system.

1,135,654. INTERCOMMUNICATING TRUNK-LINE TELEPHONE SYSTEM; R. M. Beard, New York, N. Y. App. filed March 1, 1907. Renders practicable the connection of 100 or more intercommunicating telephones in one system.

1,135,656. DYNAMO-ELECTRIC MACHINE; B. A. Behrend, Norwood, Ohio. App. filed June 25, 1906. High-speed turbo-alternator.

1,135,663. ELECTRIC LIGHTING; W. W. Coblentz, Poland, Ohio. App. filed July 7, 1908. Glower of aluminum oxide and potassium aluminum silicate.

1,135,670. SAFETY-STOP APPARATUS FOR RAILWAYS; I. Czavra, Brooklyn, N. Y. App. filed Sept. 15, 1914. Contact-rail system.

1,135,686. THERMO TELEPHONE; B. Gwozdz, Berlin, Germany. App. filed Aug. 15, 1911. Has Wollaston hot wire.

1,135,687. THERMIC TELEPHONE; B. Gwozdz, Berlin, Germany. App. filed Sept. 14, 1911. Hot-wire device which can be carried within the auditory duct.

1,135,717. GROUND CLAMP; W. H. Price, Moores, Pa. App. filed July 15, 1913. Simple clamp for securing a wire looped about a water pipe.

1,135,798. ELECTRIC RAIN ALARM; H. J. Hirschmann, St. Louis, Mo. App. filed April 25, 1914. Sounds alarm as soon as rain starts to fall.

1,135,801. CENTRIFUGAL CUT-OUT; L. W. Horting, Lancaster, Pa. App. filed Jan. 10, 1913. Reduces arcing and frictional wear.

1,135,870. MOTOR STARTER; G. H. Whittingham, Pikesville, Md. App. filed Sept. 29, 1911. Electromagnets control each section of the starting resistance.

1,135,887. CALL-REGISTERING DEVICE FOR TELEPHONES; E. Ferran and F. D. Tweeddale, San Francisco, Cal. App. filed March 16, 1914. Nickel telephone box.

1,135,894. BRANCH BOX; M. Havens, Jr., Albany, N. Y. App. filed May 20, 1911. Has a double closure.

1,135,898. MAGNETO-ELECTRICAL GENERATOR; A. L. Heizer, Anderson, Ind. App. filed April 22, 1909. Has oscillatable pole pieces and oscillatable permanent magnets.

1,135,916. FIRE ALARM; J. H. Owen, Newburgh, N. Y. App. filed March 20, 1914. Wax holds plate out of contacting relation.

1,135,920. SELECTIVE ELECTRICAL SIGNALING; L. M. Potts, Baltimore, Md. App. filed May 7, 1910. Has relays responsive to modified impulses.

1,135,926. PUSH-BUTTON; G. E. and E. B. Roedding, Detroit, Mich. App. filed Feb. 6, 1914. For autos; may be used to control a plurality of accessories.

1,135,940. LIGHTNING-ROD CABLE; P. J. Juel, Council Bluffs, Ia. App. filed April 5, 1912. Has large surface in proportion to weight.

1,135,971. TELEPHONE-CALL RECORDER; D. J. McGauran, Geraldton, Western Australia, Australia. App. filed Dec. 15, 1914. Registers only the effective calls.

13,901 (reissue). AUTOMATIC TELEPHONE SYSTEM; F. Newforth, Jr., Chicago, Ill. App. filed Aug. 24, 1914. (Original patent No. 1,078,690, Nov. 18, 1913.) Prevents ringing current being projected over line before its line relay is disconnected.